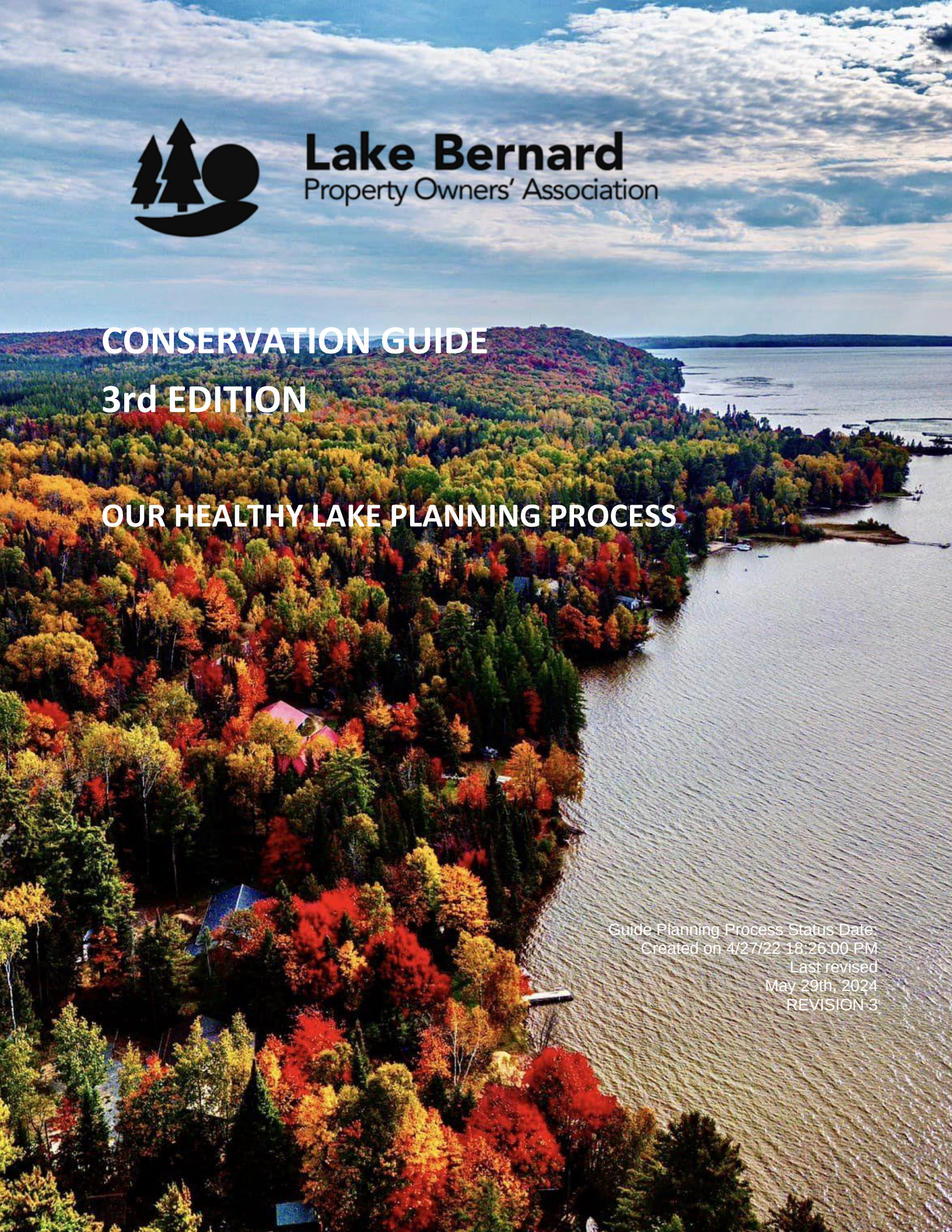

Lake Bernard
Property Owners' Association

CONSERVATION GUIDE
3rd EDITION

OUR HEALTHY LAKE PLANNING PROCESS

Guide Planning Process Status Date:
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REVISION 3

Lake Bernard
Property Owners' Association

Background

The 1st Edition of the Lake Bernard Conservation Guide (the Guide) was published in June, 2013 by the Lake Bernard Property Owners' Association (the LBPOA) through a committee chaired by Jim Wright, then Chair of the LBPOA, and Jocelyn Palm, Director of Glen Bernard Camp. Contributing Committee members were Doug Cuthbert, Past Chair of the LBPOA, Bob Renaud, a lake property owner, David Gray-Donald, Porpoise Consulting, as well as other community members. The LBPOA intended that the Guide would be a vision, planning and educational document focused on the health of our lake and that it would be updated as new relevant information became available in the future.

In support of this goal to focus on the health of our lake, on September 3, 2020, the LBPOA organized and then established the Roundtable on Lake Health for Lake Bernard with a mandate to discuss and collaborate on lake health matters. The members of the Roundtable represent those organizations most responsible for influencing consideration and action on lake health matters, namely: The Village of Sundridge, the Township of Strong, the Near North Enviro-Education Centre (NNEEC), the Almaguin Chamber of Commerce and the Lake Bernard Property Owners' Association (LBPOA).

During the summer of 2021, the LBPOA recognized the importance of keeping the Conservation Guide relevant to our current environment and scientific knowledge and therefore initiated a review of the 1st Edition with the purpose of identifying those sections that should be updated and how we could proceed with the most effective approach to manage lake health issues. Our Lake Steward, Alan Burt, has already identified most of those areas including the incredible work of Marilee Koenderink and the Phragmites Volunteers.

The LBPOA, understanding the critical role that the Roundtable would play in lake health, presented the concept of completing a 2nd Edition review and revision of the Guide to the Roundtable on October 21, 2021. The Roundtable members agreed that we should proceed.

A working committee to create the 2nd Edition of the Guide was then established by the LBPOA. The members were from the LBPOA Board:
Sherrie Berdusco – Past President of the LBPOA Board;
Alan Burt – LBPOA Lake Steward and Board Director
Doug Cuthbert – Previous President of the LBPOA, and;
Bob Renaud – LBPOA Board Director.

The purpose of the 2nd Edition is to not only update the Guide with current and relevant information, but also to establish a systematic and ongoing process to address current and future threats to our lake through recommended actions. These threats include the recently occurring blue-green algae blooms, shoreline erosion, groundwater quality, invasive species and climate change. This process also establishes a database to measure and monitor lake health issues over time.

Our intent is to make the Guide a living document. Every time an addition or revision is made to the Guide, the Status Date on the front page will be updated to demonstrate that Guide data and related information is current to that date.

The 2nd Edition recognizes, with minor revisions, the Vision and Mission as well as the research, documentation and content represented in the 1st Edition. It also recognizes that much of the content of the 1st Edition continues to be as applicable now as it was in 2013.

1. Introduction

"Like any individual, a lake ages in a natural process called eutrophication: the increase in nutrients due to run-off from the surrounding area and the growth and decomposition of aquatic plants over time. Eventually, so much decomposing plant and animal matter builds up that the lake bottom fills in, converting it to a bog and eventually, dry land. On the geologic time scale, this is a good and normal thing and from a lake's point of view, this is its circle of life." (The Shore Primer: Government of Canada publication)

But when humans fast-forward the process by tearing out the shoreline buffer zone and dumping too many nutrients such as phosphorus into the lake, the water begins to change too rapidly for the life that depends upon it. The water becomes murkier as plant and algae growth explodes, the added vegetation decomposing and consuming the oxygen normally shared with other aquatic creatures. Sensitive species like trout can suffocate in the oxygen depleted environment, interrupting the food chain and causing fish with a higher tolerance of lower oxygen conditions (like carp) to flourish.

"The lake can age before its time as eutrophication is often the result of a lot of small actions - poor septic systems, using high-phosphate soaps, removing shoreline plants - it can also be arrested by the efforts of landowners. By understanding how a natural shoreline functions, and then acting collectively to preserve, not destroy that critical balance, individuals can make a difference."[1]

A Conservation Guide is simply an organized plan to identify and deal with current and potential issues that could impact the quality of the lake for its residents, cottagers, visitors and related businesses.

Many lake regions in Ontario, such as Lake Vernon, Peninsula Lake, Eagle Lake, Kahshe Lake, Lake Cecebe, District of Muskoka lakes, Kawartha Conservation lakes, as well as other lakes have developed their own Lake Plans. We believe that we have one of the best lakes in Ontario, if not the best, and we want to keep it that way.

The objective of this 2nd Edition Conservation Guide is to establish recommendations for sustainable environmental, economic and social activities in the Lake Bernard area that will:

- Preserve and protect the environmental integrity of the water and surrounding shorelines of Lake Bernard.

[1] The Shore Primer - https://publications.gc.ca/collections/collection_2011/mpo-dfo/Fs23-507-4-2011-eng.pdf

- Sustain the natural quality and attractiveness of the lake for residents, cottagers and visitors.
- Identify threats to our Lake and Region based on reviews of the current situation and related issues.
- Propose and promote regional actions, including from regional governments, lake health and watershed organizations as well as lake property owners, when those actions are deemed the most appropriate to deal with threats to our Lake Bernard.

The dialogue in this document is intended to educate and recommend actions to regional governments, lake property owners and other interested parties as to what each of us can do to preserve our beautiful Lake Bernard for future generations.

2. Vision and Mission

When the 1st Edition of the Guide was developed, the Communities of Strong, Sundridge and Joly, through their respective Mayors and Councils and the LBPOA, committed to partner in building a successful future for the Lake Bernard community. The Vision Statement for the 1st Guide set the framework to support what the residents feel the lake should be recognized for in the future. The 2nd Edition Guide accepts this Vision as well as the Mission as stated with minor modifications:

Vision Statement: Our Vision is to be recognized and respected in Ontario as a model lake region as demonstrated by the quality of life and positive experiences of residents, cottagers and visitors.

Our Vision will be achieved through the successful stewardship of our lake and watershed, through regional governments, related provincial Ministries, as well as community and individual ownership of environmental issues.

Mission Statement: Our Mission is to engage the communities of Strong, Sundridge and Joly in striving to achieve our Vision to make our Lake Bernard area a model lake region by identifying threats to the health of our lake and associated recommended actions, then communicating and implementing those recommendations through the Roundtable.

3. Current Situation, Threats and Recommended Actions

We should never assume that our lake will always be clean, always be safe for wildlife and the fishery no matter what we do or not do. Recent experiences with toxic blue- green algae blooms in our Lake Bernard should provide all the proof that we require that we can't take the health of our lake for granted.

This initiative should not be considered a one-time effort, but rather an ongoing process of managing the health of our lake based on:

- a defined process to address threats and complete actions;
- scientific and measurable data;

- a clear and effective communication system; and
- assigned responsibility to complete defined actions as well as monitor progress.

We all understand that our lake will not remain healthy or become any healthier unless we have a plan with measurable objectives in order to ensure a healthy lake.

There are lake health related issues that are out of our control, some of which will become more severe from climate change. For example, heavy rains in the Spring or Summer that can lead to shoreline erosion and the high air temperature and calm winds that can promote growth of toxic blue-green algae blooms.

However, there ARE issues within our control and, as guardians of this beautiful lake, it's our responsibility to ensure its health for generations to come. This Guide presents some of those issues that can negatively impact the health of our Lake Bernard. **Each issue will be detailed with the Current Situation, Threats that need to be addressed and Recommended Actions. Since we have planned for this Guide to be a living document, we also have included a Status section for each identified Threat and Recommended Action in order to track and record actions taken to eliminate or reduce the Threat.**

It should be noted that when a new Threat is identified, it will be studied based on available data. It will then be entered into our Guide with Recommended Actions. Further, where there is additional useful information available on an identified Threat or issue, it will be added or attached as an **Appendix** to this Guide.

Phosphorus Levels and Blue-Green Algae (BGA) Blooms

Current Situation

Phosphorus levels are the standard indication of lake health (in the absence of obvious industrial contamination or inflows of salts). There is a natural amount of phosphorus in the soil and in the lakebed that has always been there. Major additions of phosphorus, beyond the natural recurring amount, threatens the entire lake system. High phosphorus levels often lead to algal blooms, many of which are toxic.

Lake Bernard water historically had a low concentration of phosphorus and there is no discernible trend up or down since testing began in 2002 through the Lake Partner Program between MOE and LBPOA. This is because the average total phosphorus level has been below 10 µG/L for the period 2002-2022, making it oligotrophic: un-enriched. This sampling program, which takes place some distance from shore at 4 locations, does not preclude the existence of elevated concentrations of phosphorus in the shallow nearshore from various possible sources and mechanisms, any of which could lead to an algal bloom. (Appendix S).

1. Data sets are available at; http://www.ene.gov.on.ca/stdprodconsume/groups/lr/@ene/@local/@lakepartner/documents/native docs/stdprod_082417.pdf

Such sources include leaking septic beds and fertilizers containing phosphorus (from lawns and agricultural uses) that can contribute to the build-up of phosphorus in the lake. There may be a delay between sedimentation of phosphorus on the lakebed and increases in its presence in the water, as has been seen in other lakes, as they quickly reach a "tipping point".

In addition, climate change-induced warming of the lake waters may make the threshold for increased algal growth response at lower phosphorus concentrations much more likely.

Threats

We have experienced several occurrences of blue-green algae (BGA) blooms in recent years, something that all of us probably would never imagine could happen in our pristine lake. Now that we know that it has happened, we have to acknowledge that it likely will occur again, and probably more often, if we don't develop and implement a plan to determine the causes and take necessary preventative actions.

If we choose not to act, there will be very negative consequences relative to our quality of life, our fishery and wildlife, our property values and the image and reputation of our communities. Since Lake Bernard is part of the Magnetawan River Watershed, toxic BGA could be shared with the other downstream rivers and lakes through Bernard Creek.

Recommended Actions

a. Formalize the process and contact information with the village and township for property owners to report sightings.
b. Formalize an effective communication process to notify residents, tourists and businesses when results indicating presence of BGA blooms in our lake has been confirmed. Warnings about toxicity have to be confirmed.
c. Continue communications and education about toxic BGA. Include identification, causes, harmful effects for humans and animals as well as the official reporting process with all lake property owners and businesses.
d. Determine, if possible, historical mapping of past reported sightings to create a database and assist in determining causes. In the future, add to the database where and when potential sightings occur and the results of testing.

Status

Action	*Person Responsible*	*Date*

Septic Systems

Situation

Septic systems are traditionally viewed as a potential primary threat to lake health, largely due to the fact that they contribute phosphorus into surface waters through seepage. Septic systems also leach nitrates, which can lead to algae problems, poor water quality through discharge of hormones, antibiotics and household chemicals.
The rate of leaching depends on the quality of the septic system, its age and the characteristics of the soil. The North Bay-Mattawa Conservation Authority has jurisdiction

over septic systems in our region. Mandatory testing of septics by the province is required in the Lake Simcoe region.

The 1st Edition of the Conservation Guide identified this issue as a primary threat to the health of our lake. It was also the first initiative discussed by our Roundtable of Lake Health.

Recently, the LBPOA has offered property owners two expert webinars on maintaining septics. We also developed a survey on septic systems which was completed and returned by 103 residents of the 381 lakefront residents (27% response rate). The goals of the survey were to; educate owners, encourage owners to consider what actions should be taken with their own systems and gather important data that could be used for future planning. Detailed survey results are presented in Appendix D.

The 5 main results of the survey are:

1. **Septic systems** make **90%** of sewage treatment systems on lake
2. **Age of septic systems**
    a. 34% don't know
    b. **21% - >30 years**
    c. **21% - 20-30 years**
    d. 52% - 0-20 years
3. **Recent Inspection**
    a. **74% - No Inspection yet**
    b. 20% - 1-4 years
    c. 4% - 5-10 years
    d. 2% - >10 years
4. **Septic Tank Pump Out**
    a. 8% - 1-2 years
    b. **67% - 3-5 years**
    c. 17% - 6-9 years
    d. 5% - >10 years
5. **Renters aware of septic needs**
    a. **14% - No**
    Only 14% of cottages are rented

Septic systems make up the majority of disposal methods on the lake. Of these, 74% apparently have not been inspected recently. When asked about the age of their system, 34% did not know, 42% were greater than 20 years (expected life expectancy of average septic system is 20-30 years) and 52% were less than 20 years.

Threats

As previously stated, recent occurrences of toxic blue-green algae blooms should be a wake-up call for all our lake property owners and septic systems are a likely contributor.

As stated, there have been numerous and continuing efforts by the LBPOA to educate property owners regarding septic maintenance including inspections, cleaning the filter annually and pumping out the septic tank on a regular basis. The Federation of Cottage Owners (FOCA) has published in their Healthy Waterfronts booklet, "The frequency of pump-outs will vary with the size of your tank, your family size and the number of appliances you use." We would add that full time residents will require a higher frequency of pump outs than part time cottagers."

The concern is that requests for voluntary actions usually are not highly successful. There are two basic reasons.
. Educational webinars and other types of communications for lake property owners never reach every single person.
. Some owners likely have never maintained their septic, don't see any reason to start doing so and may hesitate due to cost.

Recommended Actions

a. Continue education at every possible opportunity
b. Establish a bylaw for a required septic re-inspection program similar to the Algonquin Highlands and Muskoka Lakes. Program details are on their respective websites. The Algonquin Highlands inspection fee is $179.
c. Establish a requirement (bylaw?) that all septic systems on the lake be pumped out when the system is ⅓rd full, the same requirement as in the building codes.

Status

Action	*Person Responsible*	*Date*

Antibacterial Soaps

Situation

This is not just a phosphate issue, but it is an issue that can negatively affect a septic system. Many people use antibacterial soaps to wash and bathe. Septic tanks require useful bacteria to operate effectively.

Threats

When people use antibacterial soaps, these soaps drain into the septic system and kill the useful bacteria which are required to effectively operate the septic system.

Recommended Actions

. Continue communications and education to inform property owners about the negative effects of antibacterial soaps on septic systems
. Request that local grocery/hardware stores create signage warning about the negative effects of antibacterial soaps on septic systems or try to promote "Septic Friendly" products.

Status

Action	*Person Responsible*	*Date*

Fertilizers and Pesticides

Situation

Lawn and garden fertilizers and pesticides do contain phosphorus that can be harmful to our lake. Even products that claim to be phosphorous free contain nitrogen, which is also a problem. There are properties around our lake that have lawns that are close to the lake's edge.

Threats

If fertilizers and pesticides of any kind are used on shoreline properties, or within 30 metres of the lake, the runoff will have a negative effect on the lake by increasing the levels of phosphorus, nitrogen and other chemicals as well as the chances for the growth of blue-green algae blooms.

Recommended Actions

- Continue education and reminder communications to eliminate use of fertilizers and pesticides.
- Approve bylaw to prohibit the use of fertilizers and pesticides on shoreline properties, or at least within 30 meters of our lake.

Status

Action	*Person Responsible*	*Date*
By-law passed for Sundridge	Mayor Hall (RTLH)	

Phosphates in Soaps, Laundry and Dish Detergents

Situation

Most hand and bath soaps as well as laundry and dish detergents contain phosphates.

Threats

When used on properties that require septic tanks, the phosphates in these detergents enter the septic drain area. Septic systems depend on good bacteria to work efficiently and the phosphates have negative effects on these good bacteria.
The phosphates can also seep out of the tank and harm the groundwater as well as surface water and be washed into the lake.

Recommended Actions

a) Continue communications and education regarding the negative impacts of phosphates on the septic system and the groundwater.
b) Request that local grocery stores create separate sections or notices on their shelves for phosphate free soaps and detergents.

Status

Action	*Person Responsible*	*Date*

Groundwater Quality

Situation

The following was researched in the Kearney Watershed Study (2005): "… surface water quality surveys, background information synthesis, a terrain analysis, septic inspections, groundwater surveys and analysis, public meetings and reporting was initiated ..."

Surface water: Surface water quality was generally good, with little enrichment. Zinc and aluminum levels were high but that was characteristic of the area and natural. Some bacterial enrichment occurs further down the watershed near inhabited areas.

The authors concluded that "shallow groundwater has been degraded". It should be noted that this is analogous to Lake Bernard due to proximity and presence of "shallow groundwater system in thin soils over bedrock and by surface water in the form of lakes, rivers, streams and soils over wetlands". It was determined that:

. 6.5% of septic systems were considered high risk of failure.

. 9 of 68 wells had coliform bacteria in them, indicating cause for concern.

. 38% of wells had nitrate levels above background (significantly above natural level), potentially indicating surface influence (fertilizer) and septic influence on groundwater quality. Groundwater has a direct connection to surface water, making it important to keep groundwater clean.

The Kearney study did indicate reasons for concern and that was over 20 years ago. The current situation needs to be scientifically determined. Our region is highly dependent on healthy and clean groundwater.

Threats

Since we are not aware of any study, similar to the Kearney study, that has been completed in our region, we have limited information on the quality of our groundwater. Any problems that could result from chemicals, bacteria and parasites that could infect the groundwater must be determined.

Recommended Actions

a. Confirm what scientific testing and measurements are currently being completed in our region.
b. Establish an ongoing process to build on current data and confirm additional testing that should be completed to measure the current and future quality of our groundwater.
c. Determine required actions for the short term and longer terms

Status

Action	*Person Responsible*	*Date*

Shoreline Naturalization - Buffer Zone Management

Situation

There are many nasty things waiting to catch a lift down to the lake with rain runoff. These include seepage from septic tanks, fertilizers and pesticides, deposits from family pets and

oil or gas spilled in the driveway. For many waterfront residents, our quiet spot by the lake is our little bit of paradise. But it is a special place for another reason as well.

The zone where the water meets the land, also known as the ribbon of life, is one of the most important for the fishery and for nourishing the lake with oxygen. The waterfront is crucial to the lake's health providing food, cover and barrier to contaminants, as well as a living retaining wall for the shoreline.

The Municipal Act requires a "Tree Canopy and Natural Vegetation" Policy which includes a section on Shoreline Vegetation and buffers.

It is important to note that shoreline property owners are not allowed to modify the lakebed (high water mark to center of the lake) for any reason or by any means without authorization from the MNR or from the DFO (Department of Fisheries and Oceans). Exceptions are to install a waterline, a dock crib not measuring more than 15 square meters on the lakebed or for a floating raft. One is encouraged to install a dock that is floating or on legs so that water flows naturally along the shoreline, where possible, and vegetation should be left undisturbed.

Threats

Developing undeveloped shorelines invariably leads to some amount of erosion of the ground and some sediment entering the lake. Sediment can bring phosphorus and other materials not natural to the lake into the lake. It also has a negative impact on fish spawning. The MNR recommends maintaining 75% of property shoreline with natural vegetation.

As stated in above, major additions of phosphorus, beyond the naturally recurring amount, threatens the entire lake system and can contribute to blue-green algae blooms.

Recommended Actions

a. Plan and complete the Love Your Lake (LYL) program for all the properties on our lake. This shoreline evaluation program was developed by the Canadian Wildlife Federation (CWF) and Watersheds Canada. Over 150 lakes in Ontario (including lakes around Muskoka) have already been assessed. Although there is not yet an implementation organization in our region, CWF has offered to train and support the LBPOA in establishing a program for Lake Bernard. LYL includes an evaluation of all shorelines (done by volunteers), a collation of data (by CWF), a summary report given to both municipalities and the LBPOA. As well, the results for each property will be provided to each property owner with recommendations on how to naturalize their shoreline. All of this is for free to the property owner. A complete program process will be shared and discussed with both Councils.
b. Communicate and educate lake property owners on the importance of shoreline naturalization as well as actions that can be taken depending on the type of lakeshore such as rocks or lawn.
c. Establish, or enforce, a bylaw that will keep the MNR recommended 75% of the shoreline naturalized.

Status

Action	*Person Responsible*	*Date*

Wastewater Management

Situation

(This section needs further investigation)

The effect of this threat has received very little study at Lake Bernard. This section is mostly based on visual observation. Wash water from commercial activity and local businesses appears to go directly into the lake untreated. Other sources of wastewater come from people camping around the lake who may dump their grey water on the ground, which is typically sandy and not far from the lake. When it rains, this water likely enters the lake without much in the way of natural filtration. Or some campers are putting grey water directly into the lake.

The Village of Sundridge storm sewers flow into the lake, with catch basins near the road, designed to reduce the flow and so that floating sediment isn't deposited directly into the lake. In Strong Township, ditching along the roads has been carried out to protect the roadbed and the ditches extend directly to the lake edge with the detrimental effect of sediment flowing into the lake without filtration.

Assuming salt is mixed with sand then used in treating snow and ice for winter road conditions, is the snow cleared and deposited away from the lake to avoid melting flow into the lake?

Threats

As previously stated in Sections A) and C), any sediment deposited in a location that will flow into the lake through rain or any other natural event could eventually threaten the health of the whole lake. It is important to understand that because certain policies and actions have been accepted for many years doesn't mean that it should be acceptable for the future.

Recommended Actions

- Identify all possible sources of wastewater as described above in the Situation section
- Determine and complete corrective actions that could be taken to reduce wastewater from entering the lake OR ensuring the cleanliness of the wastewater that does enter the lake

Status

Action	*Person Responsible*	*Date*

Invasive Species

(this section written with assistance from Marilee Koenderink)

Current Situation:

- Invasive species kill, crowd out, and devastate native species and their ecosystems. They are plants and animals that are not native to the lake and have ~~a~~ detrimental environmental, economic, and/or social impacts
- We currently have invasive *Phragmites australis*, rainbow smelt and spiny water fleas in our lake, with other invasives around predicted to arrive because of climate warming.
- The Phragmites Working Group Lake Bernard, a community collaborative of volunteers, The Near North Enviro-Education Centre (NNEEC), and community partners, has headed up the fight against Phragmites.
- The introduction of some invasive species can be prevented.

Threats:

- If not addressed, invasive species will increasingly have a negative impact on species at risk, our lake and our community.
- Management of invasive species costs taxpayers time and money and requires collaborative effort to control or eradicate. It is possible that eradication might not ever be possible.
- Rainbow smelt threaten our lake whitefish population (rainbow smelt prey on the juvenile whitefish and potentially juvenile lake trout).

Recommended Actions

- Continue with community partners to support the eradication of *Phragmites* from our lake and shoreline. In 2022 the LBPOA won a $5000 grant to help NNEEC with the efforts of the *Phragmites* Working Group Lake Bernard.
- Limit or avoid any introduction of invasive species by educating our community.
- Encourage the rinsing of boats prior to entering or leaving Lake Bernard. Since the Ontario Government has established rules, effective January 1, 2022, requiring owners of watercraft to take “Clean, Drain, Dry” measures to stem the spread of invasive species between bodies of water, it is recommended that we consider utilizing the Canadian Council on Invasive Species who have a Clean Drain Dry program that is available to lake communities.
- Communicate the “Grow Me Instead" resource to help property owners choose native plants that help our environment.
- Work with the *Phragmites* Group, community partners and the Ministry to determine actions that could be taken to address invasive species. The Ontario Government has prepared presentations if suspected invasive species are encountered by Gardeners, Boaters, Anglers, Hikers and Cottagers. Utilize Best Practice Documents for management.
- Monitor fishing huts and educate fishermen on the dangers of releasing bait into the lake. They are only allowed to release or use bait fish if they were collected in Lake Bernard. This was the probable method for introduction of rainbow smelt. Improve communication with local bait shops on the requirements as well as educate fishermen, including winter, to not release ANY bait in our lake that did not come from the lake.

See Appendix B for further information.

Status

Action	*Person Responsible*	*Date*
Webinar held with Matthew Robbins, Aquatic Invasive Species Outreach Liaison, Ontario Federation of Anglers and Hunters	Organized by LBPOA	Tuesday, May 17, 2022, 7-8pm

Road Salt and the Salinization of Lake Bernard

Current Situation:

- The release of the most recent LBPOA sampling, and LPP chloride (Cl) data to the FOCA website, combined with the 2009 and 2013 water chemistry data associated with the Broad-Scale Monitoring Program, has disclosed a potentially disturbing situation in Lake Bernard.

- Cl concentrations in Lake Bernard have reached **15.5 mg/L** at the dam outflow as of September 2022.

Threats:

- Studies in Muskoka, Europe and the US have indicated that the current Canadian water quality guideline for the protection of aquatic life for chloride (**120 mg Cl/L; CCME, 2011**) is not low enough to prevent harmful impacts on zooplankton (small animal critters) populations in Ontario lakes. Recent research has indicated that two of the most common zooplankters in this part of Ontario are severely impacted at **10 mg Cl/L.** Lake Bernard is currently well above this and trending upwards sufficiently that we need to be concerned.
- High concentrations of Cl will severely impair the zooplankton communities. Studies show that this leads to an increase in phytoplankton populations (algae) due to the lack of zooplankton grazing, severely impairing water quality. In addition, several important fish species in Lake Bernard feed on zooplankton, including Lake Whitefish. These would die off as the zooplankton populations are diminished.

Recommended Actions:

- Collect water quality samples from inflows, including groundwater, from around the lake, to assess the current sources and loadings of Cl into Lake Bernard.
- Any historical water quality data including Cl would also be useful in establishing a more site-specific background concentration currently based on Muskoka data.
- Develop ways to mitigate the impact of Cl (road salt) on Lake Bernard.
- Create a site-specific species sensitivity distribution and Water Quality Guideline for Lake Bernard. This would require a more complete and recent listing of the phytoplankton, zooplankton, benthos, macrophytes, amphibians, and fish currently in the lake. A literature search to collect as much Cl toxicity data associated with these species to recreate the species sensitivity distribution. Alan Burt, our Lake Steward, is qualified to do this.

See Appendix D for further information.

Status

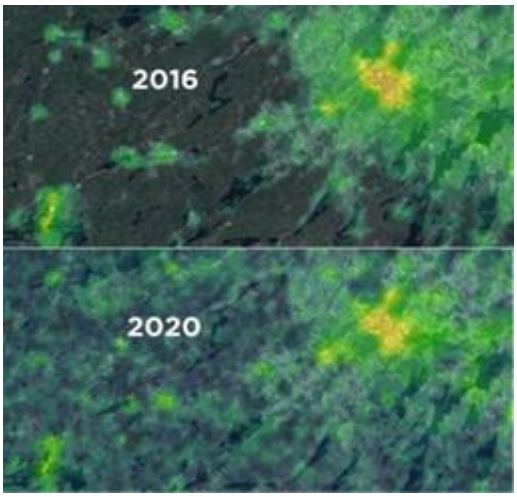
Action	*Person Responsible*	*Date*

Light Pollution

Current Situation

The challenges facing lakes now include the intrusion of light pollution originating from 'green' lighting technology, or the proliferation of white-light LED fixtures. They are marketed as low energy and cheap, both to purchase and in terms of energy consumption. However, an unintended side-effect has emerged. These lights are increasingly being left on all night and even when the cottage is vacant. The potential impacts have been presented in an article by Robert Dick, in the 2021 Lake Stewards Newsletter. **2021 Lake Stewards Newsletter | FOCA**

Threats



Prior to the introduction of LED lighting, cottage country that was predominantly dark at night, has now become increasingly illuminated. As an example, compare the two satellite images of light proliferation in Lanark County, Eastern Ontario between 2016 and 2020.

As roadway and residential lighting becomes increasingly converted to LED, the amount of night-time illumination has become a blight. It is ironic that a product developed to save energy and preserve the environment is having the opposite effect. So, what are the effects?

- LEDs are causing a 2.2% per year increase in outdoor lighting
- Within your lifetime, the sky will be twice as bright, and we will be using twice the energy for lighting.
- Outdoor lighting fundamentally changes the aesthetics of the night. The sky becomes featureless black next to bright lights and reduces visibility for both people and animals
- Foraging animals are more vulnerable to predators. Prior to this most of the month was characterized by comparative darkness until a full moon.
- Outdoor lighting changes the night environment and disrupts the ecology of wildlife
- Also undermines the enjoyment for those who may prefer the natural night they can't get in the city.

Recommended Actions

- Educate the community on light pollution and light bulb choices. White is the most impactful colour of night-time lighting and appears 5 times brighter than **amber lighting** for the same wattage of bulb. Amber light also does not attract as many

bugs. Since the LED white light consists of the combination of blue plus amber, it is possible to convert existing bulbs to amber by installing a filter to block the blue component.
- Encourage and educate property owners to shield exterior building lights. Unshielded outdoor lights can be seen for miles, yet only a fraction of the emitted light actually illuminates entrance or steps. This can be done by purchasing downward facing fixtures or by creating a simple DIY reflective shield.
- Educate the community to use lower wattage bulbs
- Turn off outdoor lights when they are not necessary (i.e., don't want visitors, go to bed and when you are away). Lights left on do not serve as a security deterrent.
- At the municipal level, the Township of Muskoka (TML) introduced a Dark Sky lighting bylaw since 2014 intended to '**ensure responsible lighting, light pollution mitigation and conservation of the dark sky environment'.** As of January 1, 2024 TML residents will be responsible for ensuring their property is dark-sky compliant. (**Dark Sky lighting bylaw**). Huntsville enacted a similar by-law in 2016 with compliance mandatory by 2026 (Town of Huntsville - Document Center (civicweb.net)). The Township of Lake of Bays enacted a dark-sky by-law in 2013 (https://lakeofbays.civicweb.net/document/12892/).

Status

Action	*Person Responsible*	*Date*

Water Levels

Current Situation:

- The MNR determines when logs are removed or added to the dam. This is traditionally done after the fact - not pre-emptively. These has been a curve with a range of lake levels that the water is supposed to remain within.

Threats:

- As we saw in Spring of 2022, quite a bit of damage can occur if the logs are not removed prior to the ice thaw.

Recommended Actions:

- Create a "Roundtable on Water Levels" including the MNR, the Mayors (or representation from each council), LBPOA and informed members. This group could meet only during the critical times (esp Spring and perhaps Fall) to ensure that the level is at where it should safely be.

Status

Action	*Person Responsible*	*Date*

The dam rating curve is presented in Appendix T.

Short Term Rentals

Current Situation:

- Some municipalities are finding Short-Term Rentals (STR) to be problematic. These issues include noise, lack of proper use of septic, etc. Some municipalities are enacting rules or by-laws

Threats:

- This could become a problem on Lake Bernard as the demand for cottage rentals is increasing.

Recommended Actions:

- Research what other municipalities are doing to help provide some parameters around STR. This could be pre-emptive for any potential issues on Lake Bernard.

Status

Action	*Person Responsible*	*Date*

Climate Change

Current Situation:

- FOCA, in their 3rd Edition Shoreline Owner's Guide to Healthy Waterfronts, states, "Climate change will affect our land and water resources, our economy and our communities …". Further, "You have a role to play in maintaining the health of your lake ecosystem, and to mitigate the effects of climate change".

Threats:

- If we do nothing to address and adapt to climate change the effects will be more severe on our lake and our community.

Recommended Actions:

- Pursue, as partners committed to a healthy lake, those recommendations contained in this document which will help ensure a healthy lake and contribute to mitigating the impact of climate change on our lake and community.
- Determine availability of any climate data such as air temperature, wind speed and precipitation. Long term records can identify areas of concern as reported for Muskoka Lakes affected by recent decreases in wind speed.

Status

Action	*Person Responsible*	*Date*

Lake Health Database

Current Situation

There appears to be limited availability of scientific and measurable data related to lake health issues that would be required to determine the current health of our Lake Bernard as well as the impacts of initiatives taken to deal with threats to our lake.

Threats

Without the availability of data related to measuring lake health issues, it would be very difficult to develop recommended actions and measure progress on initiatives taken on issues.

Recommended Actions

In order to ensure that our Healthy Lake Bernard Planning Process is organized, directed and effective, a database of required information for each identified threat will be created to enable successful actions to address the threats.

Status

Action	*Person Responsible*	*Date*
Formal Requests will be pursued through the Township, the Village and Ontario Ministries where applicable; . Wastewater Management Process, . Groundwater Data, . Weather Data, . Lake Bernard Water Quality Data, . Lake Bernard Sediment Data, . Information on Input Streams - Joly Creek if there is any and Fish Sanctuary, . Land Use Data from Township for the TP Budget. NOTE: The formal requests will be completed after review to determine the best source for the information.	Alan Burt	March 03, 2022

Costs Associated With Recommended Actions

Current Situation

There are currently limited funds within the LBPOA budget to allocate towards Lake Health Plan initiatives. We're faced with more issues than in the past, less government funding, we're a small organization and limited to our membership size. Current funds are being used for immediate issues.

Threats

If external funding is not available, it is possible that some of the Recommended Actions will not be possible.

Recommended Actions

a) Establish one time and ongoing costs associated for those Recommended Actions requiring funding.
b) Determine where funding, external to the LBPOA, can be sourced.
c) Assist Strong and Sundridge potential funding opportunities

Status

Action	*Person Responsible*	*Date*

Going Forward

As stated in the Background Section of this document, the Purpose of the 2nd Edition is to establish a systematic and ongoing process to address current and future threats to our lake through recommended actions. The process also establishes a database to measure and monitor lake health issues over time.

We believe, through our Roundtable partnership, that we will be able to achieve our Mission and pursue our Vision "... to be recognized and respected in Ontario as a model lake region as demonstrated by the quality of life and positive experiences of residents, cottagers and visitors."

The fact that you are reading this document hopefully demonstrates an interest and support for **Our Lake Health Planning Process. Thank you.**

Appendices

A. The Lake Bernard Watershed

The Area and its Characteristics

Lake Bernard's watershed is fairly small, with Lake Bernard at the top of the Magnetawan River watershed. Unlike many lakes, for example Ahmic Lake or Doe Lake, Lake Bernard is not downstream of any major lakes. Because of its relatively large size with respect to its own watershed area, and its location at the top of the Magnetawan River system, many of the factors that other lakes have to deal with are not problems here. This means the flow-through rate of water and water-borne pollutants in the lake is fairly slow. Lake Bernard has a shoreline perimeter of 23.0 km, a surface area of 20.5 km^2 (2050 hectares) and the watershed is 79.9 km^2 (not including the lake surface area). The maximum depth is 48 m and the mean depth is 16 m. Much of the shore is shallow, warming easily in summer while the depths remain relatively cold. A map of the watershed can be seen in appendix B. Due to the relatively small size of the input streams relative to the outflow it may be fair to conclude that the majority of the inflow into the lake originates from groundwater flow. Thus, groundwater quality is of high importance. (The relative inputs from inflows and groundwater will be verified during the spring 2022 TP water sampling program).

There are a variety of human activities occurring in the watershed. The shoreline area was described by the MNR in 2010 as "intense; urban, shoreline residential, commercial". This translates to: Sundridge is urban frontage, residences and businesses are located around the lake. Strong Township comprises the bulk of the watershed. It has a population of about 1,300 with no urban centre, low-intensity agriculture, and some small resource extraction operations. Sundridge is much smaller than Strong in area. It is entirely a town and is home to about 1,000 people. It has many businesses including manufacturing, retail and services.
Much of the area was lumbered over 100 years ago. Trees have grown since this time and now cover much of the watershed. Exact percentage tree cover of the area is not available.
For more lake facts, view the MNR 2019 Lake Bernard Fact Sheet at
http://www.muskokawaterweb.ca/1/1.5/factsheets/Bernard_Lake.pdf

The Flow of Water

There are a number of streams that feed into Lake Bernard, with Joly Creek in the north-east being the largest. Joly Creek flows from Otter Lake (to the north-east of Lake Bernard) and the creek acts as the Strong / Joly Township border for a portion of its length. Joly Creek passes within 900 metres of Strong Township's Landfill #1; however the bedrock flows towards the Southeast. The Ontario Ministry of the Environment (MOE) has been monitoring this landfill site for some time. There are dozens of other small creeks / streams entering Lake Bernard. Groundwater enters the lake at many locations and contributes significantly to the water supply to the lake. If the nearby Kearney Watershed Study (conducted from 2002-2004 by *Gartner Lee*) is a good indication, groundwater

easily enters lake waters. The geology and soil composition of Kearney and the Lake Bernard watershed are very similar.
Storm runoff water from Sundridge enters the lake directly through a storm water infrastructure. Water from commercial / industrial uses enters the lake untreated if it goes into the storm sewer system.

Residential sewage generated in Sundridge is pumped through a long force main pipe (10 inch) to lagoons adjacent to Bernard Creek, a short distance downstream of the outflow control dam. Bernard Creek flows into Stirling Creek, and then into the Magnetawan River, which flows through Lake Cecebe, Ahmic Lake, Wahwashkesh Lake and into Georgian Bay at Byng Inlet. The Sundridge force main sewage pipe has failed at least once in recent years, leaking into Lake Bernard until emergency repairs were made. When the sewage lagoons are flushed in the spring and fall, the effluent is discharged into Bernard Creek downstream of the dam and not into Lake Bernard as the Dam under High Rock Drive stops this reverse flow from occurring. If the force main pump fails in Sundridge (electrical or mechanical failure), untreated residential sewage can enter the by-pass sewer system and flow into Lake Bernard either untreated or treated with chlorine.
There is no central sewage system in Strong or Joly Townships. A continually upgraded system of culverts in Strong allows surface waters to flow under existing roads and into Lake Bernard. Wastewater from residences in Strong and Joly Townships enter septic systems for the most part, but some systems allow grey water from laundry areas and sinks to be discharged elsewhere. Discharged effluent from septic filter beds enters the groundwater system at various speeds. Grey water is regularly discharged into dry wells or in the case of the south end campground, into shallow holes in the ground. If the Kearney Watershed Study is a good indication, there may be some septics in the Lake Bernard area at high risk of failure, potentially compromising nearby groundwater quality.

Township/Village Designations in the Area

Sundridge is a village in the north-west corner of the lake with a mostly developed Lake Bernard shoreline. It is entirely in the Lake Bernard watershed and has the ability to create and enforce its own by-laws.
Joly Township does not border Lake Bernard. A small part of Joly Township is within the Lake Bernard watershed, most notably in the headwaters of Joly Creek. As a municipality, it has the ability to create and enforce its own by-laws.
Strong Township contains the majority of the Lake Bernard watershed as well as the majority of Lake Bernard's shoreline. As a municipality, it has the ability to create and enforce its own by-laws.

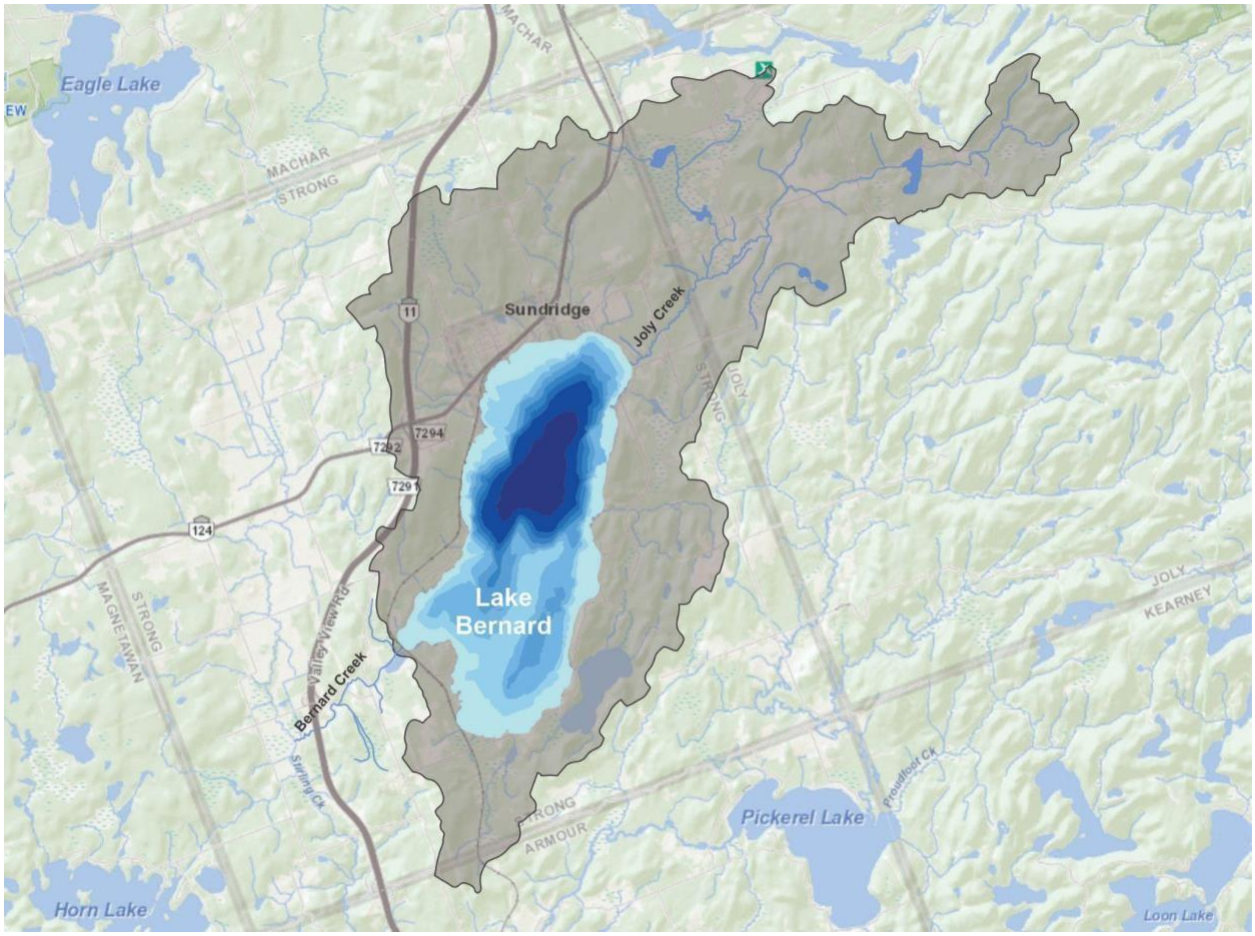
Proposed Designations in the Area for Conservation Guide Purposes

The following designation of areas within the Lake Bernard Watershed was proposed at the first Conservation Guide Committee Meeting held July 6, 2011:

- Surface area of the lake & 30 m of the shoreline
- Land area within 300 m of the shoreline (300 m is based on practice and MNR guidelines)
- Land area beyond 300 m of the shoreline but still in the watershed

The designations were generally agreed upon but there could conceivably be a change should the consensus be that it is warranted.

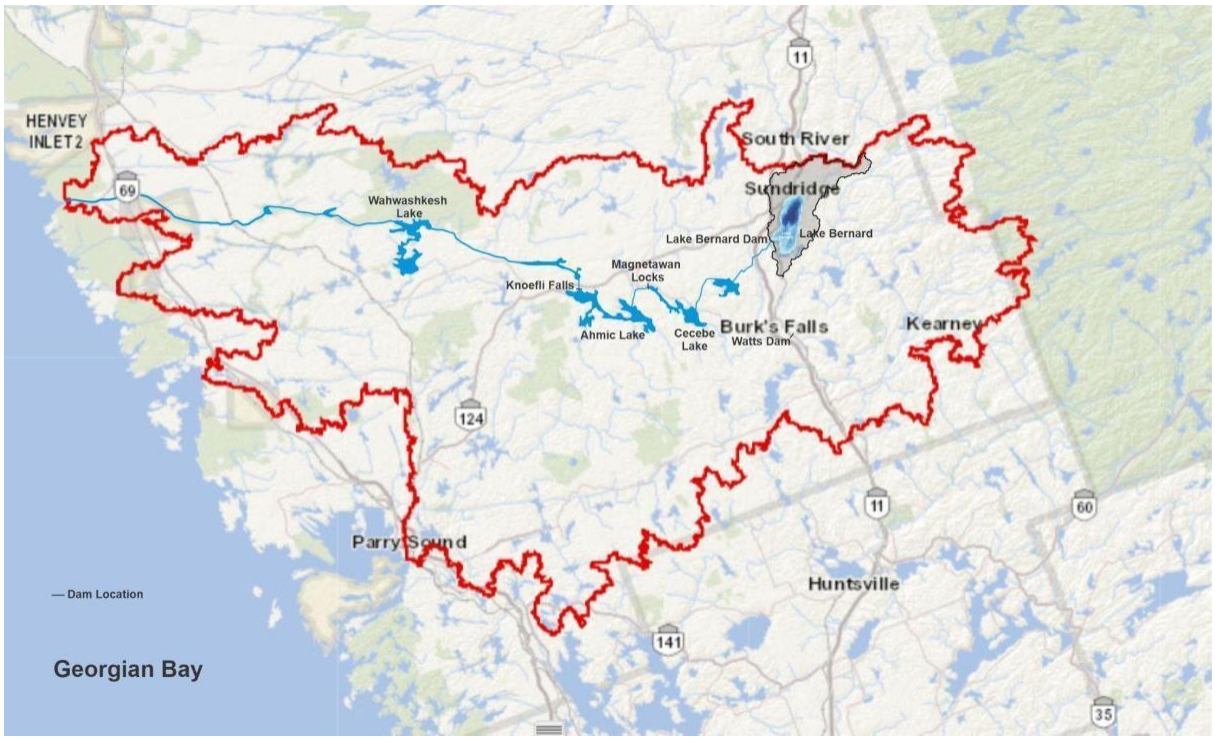
The grey-shaded area indicates the boundaries of the Lake Bernard Watershed. Only water from this area enters the lake. The watershed was generated using the Ontario Ministry of Natural Resources and Forestry Flow Assessment Tool. (https://www.lioapplications.lrc.gov.on.ca/OFAT/index.html?viewer=OFAT.OFAT&locale=en-ca



Lake Bernard is part of the Magnetawan River watershed where water flow is governed by the Magnetawan River Water Control Operating Plan (MNR, 2006; draft).

Lake Bernard's position in this greater watershed is presented below:

The Magnetawan River watershed is a large, tertiary watershed draining an area of 6,025.5 km2 (Figure 2) (Phair *et al*., 2005). The watershed is comprised of roughly 50% Crown land, 40% private land, and 10% First Nations land (Phair *et al.,* 2005). The Magnetawan river flows 175 km from its source at Magnetawan Lake inside Algonquin Park to empty into Georgian Bay at the community of Britt on Byng Inlet. Flow management on the Magnetawan River is a complex system of dams.



(Phair, C., Henson, B.L., & Brodribb, K.E. (2005). Great Lakes conservation blueprint for aquatic biodiversity. Volume 2: tertiary watershed summaries. Cited from Magnetawan River Fish Habitat Assessment. 2016. Eastern Georgian Bay Stewardship Council.

Bernard Creek Clearing

To manage lake levels to that prescribed by the MNR rule curve, Bernard Creek needs to be able to flow without serious obstructions. Beaver dams and debris slow the flow. Many of the dams are created on private land which means the municipality cannot trespass without the landowner's authority approval to remove the obstruction.

Removing these obstructions in the late fall should help somewhat as it is difficult and dangerous to remove these obstructions during high water in spring. Hiring someone to do this may be a liability. The same liability would not exist if community members took it upon themselves to do this voluntarily as has been the recent practice of the LBPOA.

B. The Lake Bernard Fishery

Numerous projects have been conducted on the lake focusing primarily on lake trout. These include stocking, population assessments, creel surveys, spawning observations, spawning habitat improvement and water quality monitoring. A creel survey was conducted during the winter of 2011, similar to ones conducted in 1993 and 2001. The purpose was to collect standard information on angling effort, catch, harvest and angler demographics applicable to long-term monitoring of the fishery."[2]

Stocking: MNR has stated, "The concern is that stocking of lake trout may impact the reproducing component of the population. Possible mechanisms are direct competition and predation, loss of genetic fitness and increased exploitation due to attracting fishing pressure (overfishing). The observation in the creel survey that the reproducing component of the population seems to have increased since stocking ceased appears to support this. There are other lakes where stocking impacts have been seen as well **Winter Fishing Summary (MNR - 2011)**; "Total winter fishing effort on Lake Bernard has been relatively stable since at least 1993. The fishery has shifted to targeting more on whitefish and less on lake trout as the abundance of stocked lake trout has declined. As stocked lake trout abundance declined, the harvest of naturally reproduced lake trout has increased, though not in direct proportion. The harvest of whitefish has increased substantially through a combination of higher targeted effort and increased catch rate. The total number of whitefish and trout harvested and the proportion of parties that were successful at harvesting at least one trout or whitefish are higher now than when stocked lake trout were common in the fishery. Supplemental stocking of lake trout for the purpose of increasing the lake trout fishery does not appear to be advisable. The recruitment of whitefish may be at risk from high abundance of smelt; though there is no evidence of an impact to date. Monitoring of whitefish recruitment should be done and consideration given to stocking of a smelt predator to control smelt abundance if an impact is detected."

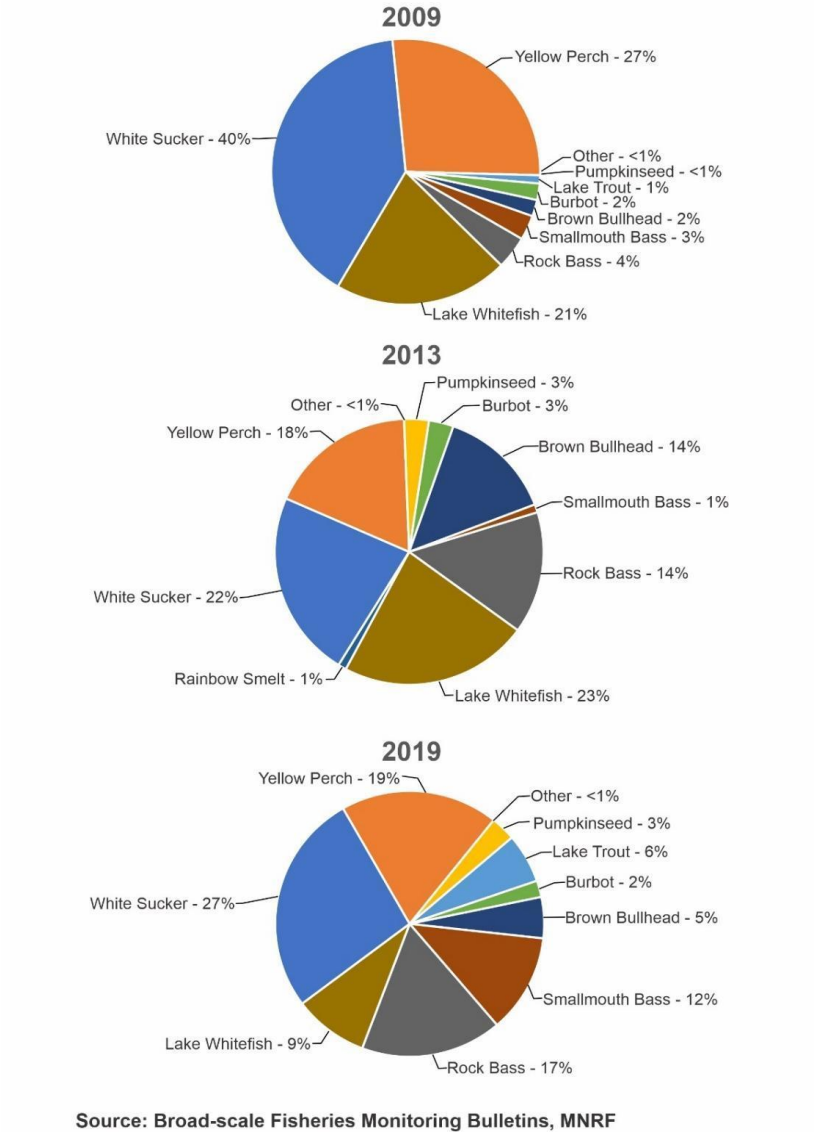
The MNRF has recently monitored the Lake Bernard fish community through the Broad-scale Monitoring Program in 2009, 2013 and 2019. According to the 2019 study (Figure B.1), MNRF states that "The coldwater fish community of the lake is dominated by whitefish (9%) and lake trout (6%), with burbot (2%), a remnant population of native brook trout, a naturalized population of rainbow trout, and introduced rainbow smelt, an invasive species. The larger warm water community is dominated by introduced smallmouth bass (12%), and rock bass (17%), as well as yellow perch (19%), white sucker (27%), Pumpkinseed (3%) and brown bullhead (5%).
Lake trout were stocked regularly from 1920 until 1996 to supplement the natural population. Stocking was suspended to allow the naturally reproduced component of the population to achieve its full potential. The lack of stocking has been unpopular with anglers and the local business community.

By 2015, the sampling indicated that there were fewer lake trout without stocking, resulting in less predatory pressure on the smelt. MNRF believes that this reduced lake trout population allowed the smelt population to rebound (regarded as high relative to other Ontario Lakes in Zone 15) after 20 years and negatively impact the lake whitefish population. The most likely reason is a combination of smelt preying on newly hatched young whitefish in addition to competing for the same food as trout and whitefish.

The coldwater community also supports burbot, a remnant population of native brook trout, a naturalized population of rainbow trout and introduced rainbow smelt, an invasive species. The warm water community is dominated by introduced smallmouth bass and rock bass as well as yellow perch, white sucker, Pumpkinseed and brown bullhead.

Figure B.1

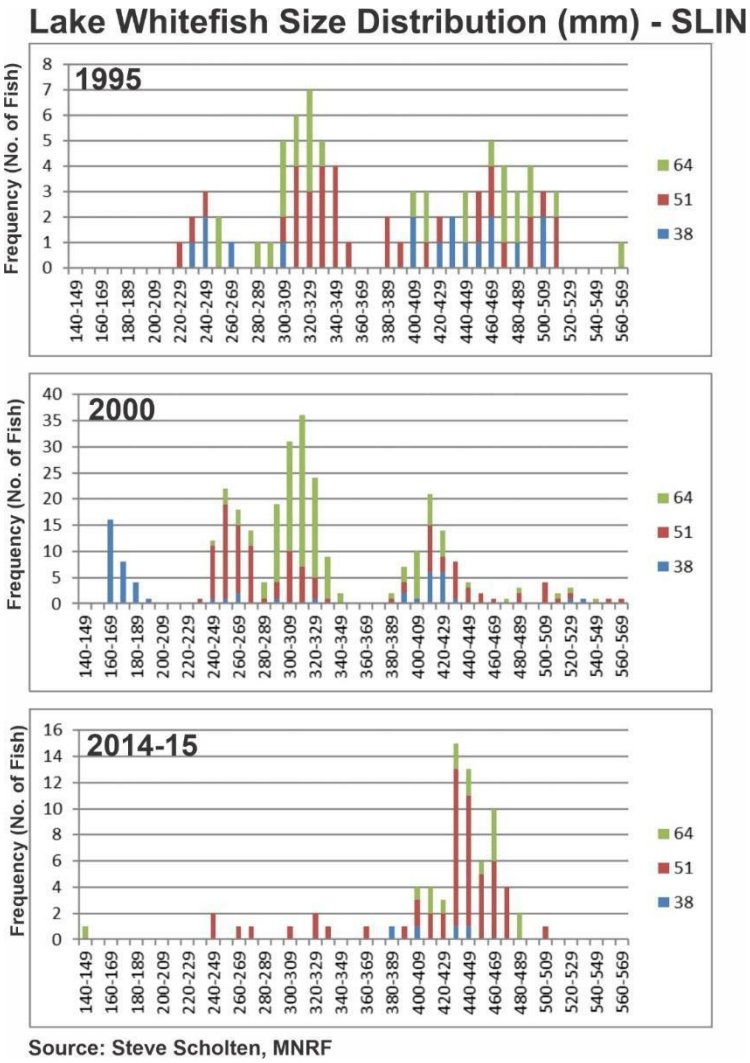
Proportion of fish caught in large mesh nets



Source: Broad-scale Fisheries Monitoring Bulletins, MNRF

The impact of rainbow smelt predation on the Lake Whitefish community in Lake Bernard is illustrated in Figure B.2.

Figure B.2



Source: Steve Scholten, MNRF

Prior to the increase in Rainbow Smelt population after 1996 cessation of lake trout stocking, the size distributions of the 1993 and 2000 fisheries studies clearly show a balanced distribution of Lake Whitefish sizes, with no missing age classes. The impact of the larger Rainbow Smelt population is evident in the results of the 2014-15 sampling when almost the entire small age classes were absent. This is most likely the direct result of Rainbow Smelt predation and impact on the same food resources as juvenile Lake Whitefish.

Figure B.3 illustrates the change in catch numbers of Lake Whitefish versus Lake Trout in Lake Bernard between 1993 and 2011. Lake White Whitefish clearly dominate the catch by 2011.

Figure B.3

Comparative Catch Numbers of Lake Whitefish and Lake Trout – 1993 to 2011

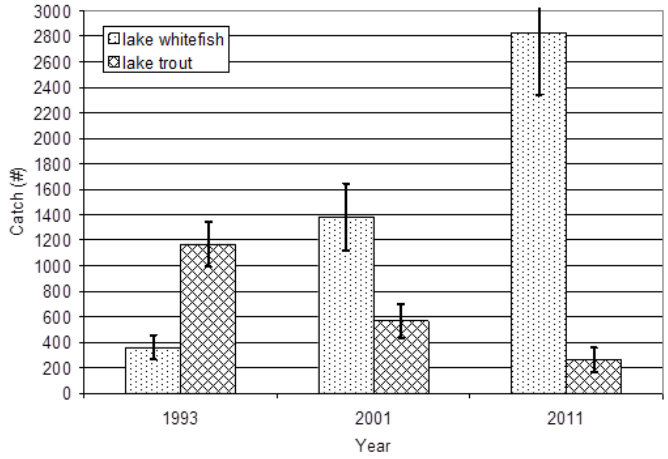
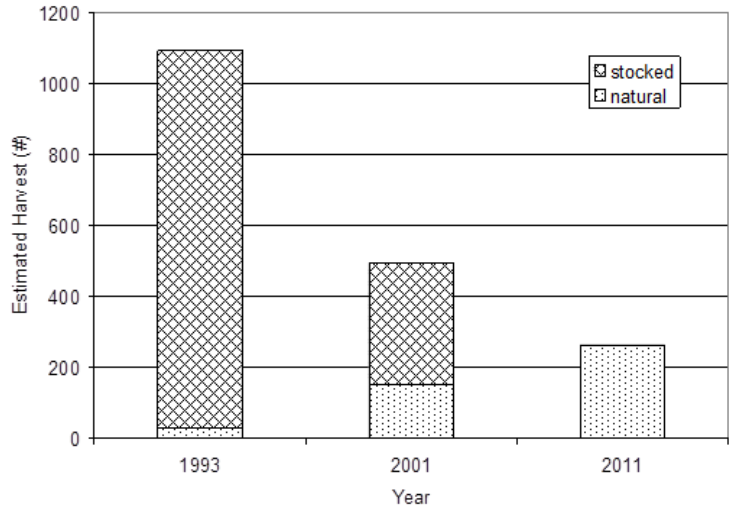


Figure B.4 illustrates the replacement of natural lake trout for stocked Lake Trout after the cessation of stocking in 1996. However, lower catch numbers were also very evident. Lake Trout were the dominant species in the lake in 1993. Once stocking stopped in mid-1990s, population shifted to progressively more whitefish. Over the same time period, the lake trout shifted from primarily of stocked origin to the naturally reproducing one.

Figure B.4

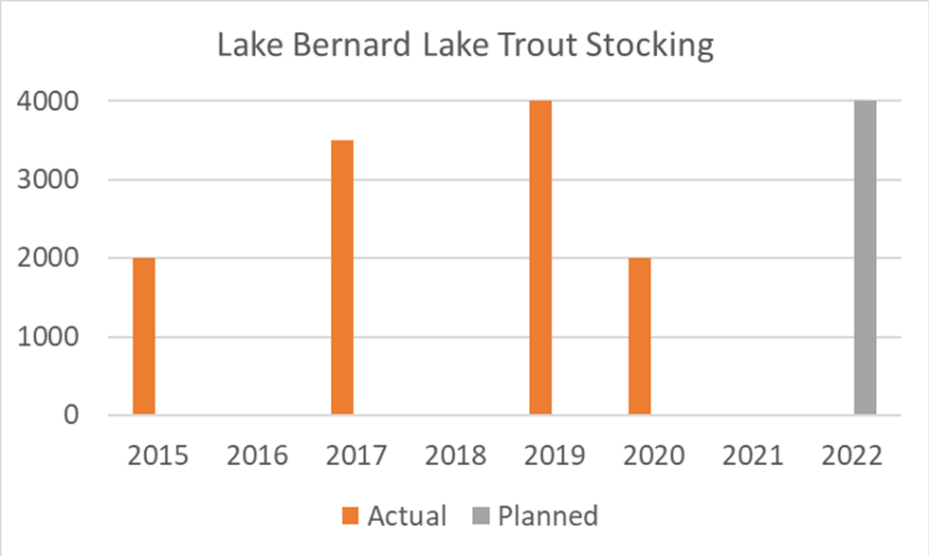
Estimated Comparative Catch Numbers of Natural Vs Stocked Lake Trout



The level of stocking since 2015 is illustrated in Figure B.5

Figure B.5

Lake Trout Stocking Levels In Lake Bernard – 2015 to 2022



2021 was an off-year for stocking in Lake Bernard and will resume in 2022 at 4,000 fish Stocked lake trout are obtained from one of MNRF's 9 fish culture stations. Released fish are usually about 16-months old, several inches long and weigh 20-30 grams. MNRF reminds fisherman that as a fishing lake, people need a license and must follow the rules including only fishing during the appropriate seasons and observing catch, possession and size limits.

References - Broad-scale Fisheries Monitoring Cycles 1 to 3

Broad-scale Fisheries Monitoring Bulletin - 2009 Lake Bulletin - Lake Bernard (gov.on.ca)
Broad-scale Fisheries Monitoring Bulletin - 2013 Lake Bulletin - Lake Bernard (gov.on.ca)
Broad-scale Fisheries Monitoring Bulletin - 2019 Lake Bulletin - Lake Bernard (gov.on.ca)

[2] Results of the Winter Creel Survey Conducted on Bernard Lake in 2011, by Stephen Scholten, MNR

C. Invasive Species

Canada is rich in biodiversity, with thousands of different plant and animal species. However, not all of the species found in Canada are native to the habitats where they are currently found. Some of them are “alien species” that have been introduced from other parts of the country or the world. Numerous factors are responsible for the introduction and spread of alien species, including:

- climate change
- unintentional introductions from ship ballast and along roads
- intentional introductions
- increased susceptibility of altered or degraded ecosystems

While some alien species do not pose any immediate risk and may even provide important benefits, many others can cause significant ecological, economic and environmental damage. These species are known as “invasive” alien species.

Invasive alien species cost the global economy billions of dollars every year. This includes the costs of control but also reduced revenues from commercial fisheries, tourism, manufacturing, and other industries. Invasive alien species harm biodiversity by:

- displacing native species and competing with them for resources
- degrading habitat
- introducing diseases, toxic and safety hazards
- breeding with native species to form hybrids

Their impact on native ecosystems, habitats and species is severe and often irreversible. Controlling invasive non-native species is expensive, and **eliminating them is seldom possible**. They are an emerging threat to northern Canadian ecosystems as climate warms and species intolerant of current northern climatic conditions expand their ranges.

Further details are available at: Invasive alien species strategy - Canada.ca . As of 1 January 2022 in Ontario, there are currently **234** registered invasive species, consisting of:

- 130 Terrestrial Plants
- 21 Forest Insects
- 34 Aquatic Plants
- 1 Terrestrial Animal
- 52 Aquatic Animals
- 5 Pathogens

For details for each of these species go to: EDDMapS

The invasive species that are known to be in Lake Bernard (presence verified by MNRF) include **Rainbow Smelt**, **Spiny Waterflea** and **Phragmites**. Terrestrial plant species, including Japanese Knotweed (*Reynoutria japonica*), Garlic Mustard (*Alliaria petiolata*), Goutweed (*Aegopodium podograria*), Purple Loosestrife (*Lythrum salicaria*) and Periwinkle (*Vinca minor*) exist along the Lake Bernard shoreline. Terrestrial fauna include the Gypsy

moth (*Lymantria dispar dispar)*. **This information will be updated as new information is made available.**

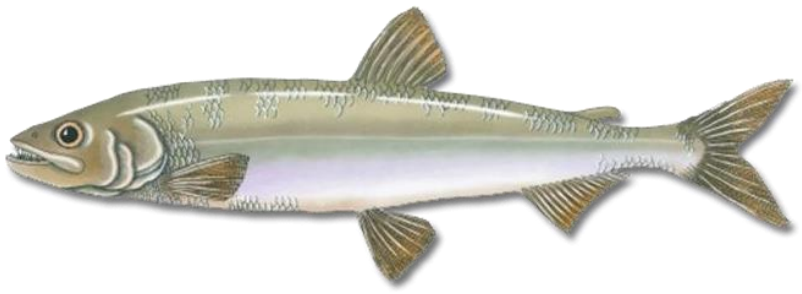
Other common invasive species are Zebra Mussels (*Dreissena polymorpha*) and Quagga Mussels (*Dreissena bugensis*). Neither of these mussel species is known to be in the lake at present. They can easily arrive. Many lakes have signs dedicated to this subject as does Lake Bernard at the south end boat launch ramp. Trout Unlimited provides the following information regarding these mussels. Zebra mussels feed on phytoplankton by filtering up to one litre of water per day, severely depleting phytoplankton communities and altering food webs of native aquatic life and aquatic ecosystems. In addition, selective feeding of this invasive species **increases blooms of toxic algae.** Large colonies of zebra mussels often kill native mussels, crayfish and snails by attaching themselves to these animals, hindering their movement, feeding and respiration. Zebra mussel clusters can also **suffocate fish spawning areas.** Female zebra mussels can lay up to one million eggs each year. Easily dispersed, the microscopic larvae are scattered by water currents, wind and waves. Within a few weeks, their shell begins to develop and they can begin dispersing by attaching themselves to the hulls of boats.

Rainbow Smelt

Situation

Rainbow smelt (*Osmerus mordax*) are an invasive species that have recently been found to be having a significant impact on the Lake Whitefish population in Lake Bernard.

Rainbow smelt are skinny, silvery fish that measure up to 20cm long. Despite their small size they are predators, eating any smaller fish they can catch. These barracuda-like predators can literally form a “wall” of predators, devouring all small fish they encounter, including young trout. Found along the eastern seaboard of the USA, they have been introduced into many lakes by anglers who use them for bait. (The Raven at http://www.algonquinpark.on.ca).



Rainbow smelt started appearing in the lake during the 1960s, with their introduction likely by fishermen. (Steve Scholten, MNRF, 2021). Broad-scale fish sampling by MNRF in 2019 confirmed a reduced Lake Whitefish population. In addition, Lake trout were also reduced as a consequence of the cessation of stocking in the mid-1990s. This is presumed to have led to the relatively unchecked growth in the Rainbow smelt population. Consequently, the MNRF resumed Lake Trout stocking in 2015 in an attempt to reduce the Rainbow smelt

population and its predation pressure on Lake Whitefish. Given time, it is hoped that this will allow the Lake Whitefish population to rebound.

Phragmites

Situation

Phragmites (*Phragmites australis*) is a highly invasive plant that has spread all across Ontario, including in and around Lake Bernard. According to Ontario's Invading Species Awareness Program, this plant causes damage to biodiversity, wetlands and beaches as it crowds out native vegetation and creates an environment toxic to other flora and fauna. The *Phragmites* Working Group Lake Bernard is a communitycollaborative of volunteers, the Near North Enviro- Education Centre (NNEEC), the Township of Strong, the Village of Sundridge, the Township of Joly, The Lake Bernard Property Owners Association and annual expert guidance from Dr. Janice Gilbert from the Invasive Phragmites Control Centre. https://www.phragcontrol.com/

The group with skilled saw operators, volunteers, approved grants and donations, has completed year three of a four-year plan to begin to manage all of the stands of *Phragmites* on shore and in the water of Lake Bernard. *Phragmites* was removed on 8 sites in 2018, 13 in 2019, 27 in 2020 and now 33 in 2021. It will take many years to effectively remove all the phragmites on large stands with ongoing monitoring for regrowth and immediate management action as required. Many property owners remove *Phragmites* on their own properties annually. Cane cutters are available through the *Phragmites* group. Here is information on safe removal:

Future plans for management include use of Truxors (amphibious machines) on the largest stands.

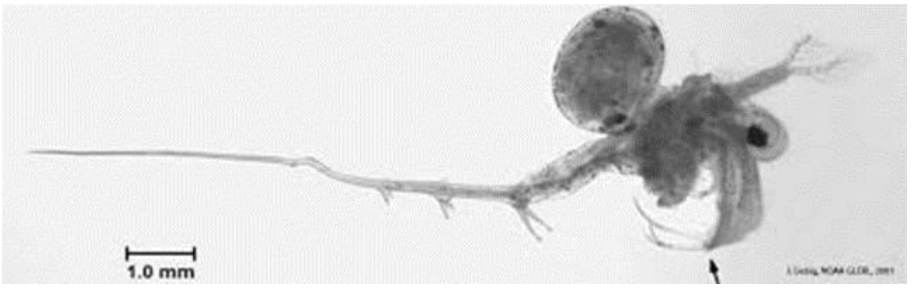
The NNEEC webpage for *Phragmites* at https://www.nneec.ca/phragmites, includes "**Recommendations for Invasive Phragmites Management on Lake Bernard "** from the Invasive Phragmites Control Centre. This report was paid for by a grant from the Ontario Trillium Foundation and outlines all methods of management.

https://25248fc4-773e-40e4-a850-4d140ec986cc.filesusr.com/ugd/1acc58_8c667559849c4337bbc41232be0373be.pdf

Spiny Water Flea

Situation

The Spiny Waterflea (*Bythotrephes longimanus*) is large (~1 cm long, 60% tail) and was introduced into Lake Bernard in 1998. It prefers large, deep clear lakes like Lake Bernard where it migrates to the deeper waters during the day and up to the surface at night. The impacts of this species include preying on native zooplankton, reducing food for small fishes and juvenile sport fish. It also fouls fishing equipment.



References for more information: Spiny Waterflea – Invasive Species Centre; Invasive Species Awareness and Monitoring Program for Lakes Education in Ontario – Invasive Species Centre;Spiny Waterflea – Invasive Species Centre

General and species-specific information for dealing with terrestrial and aquatic invasive species is presented in the LBPOA's Invasive Species Protocols Guide (Appendix X).

If you come across a suspected invasive species, report it:

- by phone: call the Ontario Federation of Anglers and Hunters' Invading Species Hotline at Toll-free: 1-800-563-7711
- online: through EDDMapS Ontario, a web-based mapping system
- on your mobile: download the EDDMapS Ontario app on your mobile phone (iOS or Android)

To help identify, manage or control invasive species, contact:
Invading Species Awareness Program
Invasive Species Centre
Ontario Invasive Plant Council
Federation of Ontario Cottagers' Association
Grow Me Instead - Ontario Invasive Plant Council

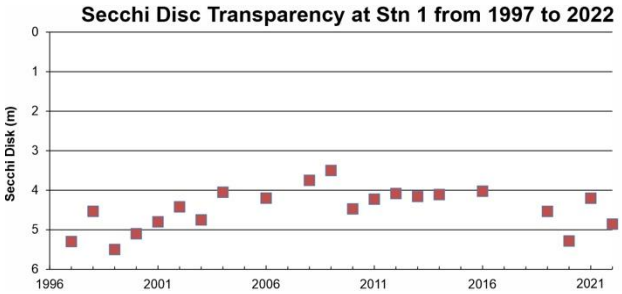
D. Water Quality of Lake Bernard

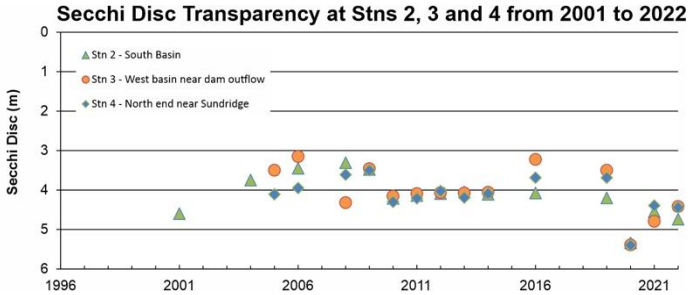
Long-term water quality monitoring of Lake Bernard began in 1997, when volunteers collected water samples for Secchi disc depth (water clarity) from the deep basin (Stn 1) as part of the Lake Partner Program (LPP). Station 2 was added in 2001, with Stations 3 and 4 added in 2004. Total Phosphorus (TP) was added in 2002, Calcium in 2010 and Chloride in 2016. The LPP is a province-wide, volunteer-based, water quality monitoring program organized by the Federation of Ontario Cottage Associations (FOCA) and the Ontario Ministry of Environment, Conservation and Parks (MECP). Water samples are returned to the Dorset Environmental Science Centre for analysis. Samples for TP, Calcium and Chloride are collected as soon after ice-out (May) as possible so that samples are collected before the lake turns over and stratification begins. Ideally, water clarity (Secchi disc) readings are to be taken at least monthly from May to October. When possible, samples can be taken on a bi-weekly basis.

Secchi Disc – Water Clarity Results

Current Situation

Decreases in water clarity can be related to increased algal production or a disturbance in the watershed (eg. Dissolved Organic Carbon, Suspended Solids). Water clarity is considered High if the Secchi Disc readings are greater than 4 m in depth and moderate if between 2 and 4 m. At Station 1 (Deep Basin), water clarity has been predominantly High since 1997, going above 4 m in 2002 and 2003. Most recently water clarity has fluctuated slightly going from 5.3 m in 2020 to 4.2 m in 2021 and increasing to 4.9 m in 2022. The decrease in water clarity in 2021 was likely due to the heavy rains throughout the summer. The other 3 stations demonstrated a similar trend, decreasing from 5.3 m to 4.4 to 4.8 m in 2021 and 2022. Station 1 is the deepest station at 48 m compared to < 6 m at the other 3.



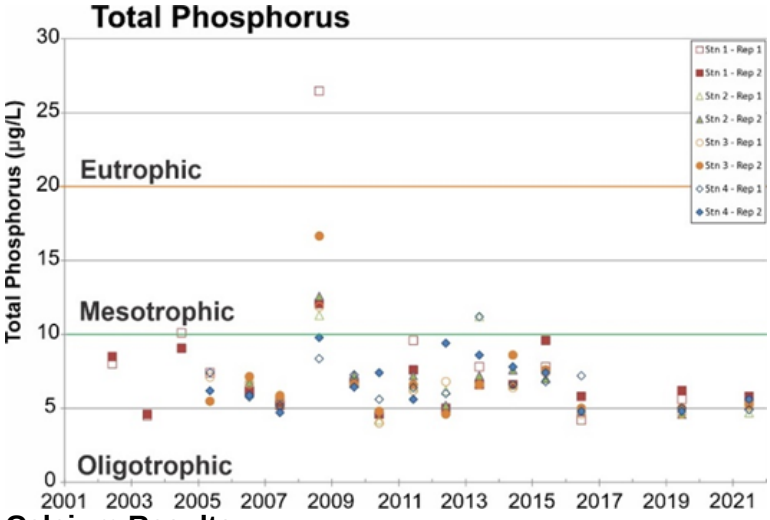


Total Phosphorus (TP) Results

Current Situation

Total phosphorus is the ideal parameter to interpret the nutrient status in Ontario lakes, since phosphorus has been shown to be the element that controls the growth of algae in most Ontario lakes. Increases in phosphorus will decrease water clarity (secchi depth) by stimulating algal growth. A common classification system grouped lakes with TP concentrations <10 µg/L as oligotrophic. These are dilute, unproductive lakes that rarely experience nuisance algal blooms. Lakes with between 10 and 20 µg/L are termed mesotrophic. These lakes show a broad range of characteristics and can be clear and unproductive at the bottom end of the scale or susceptible to moderate algal blooms at concentrations near the 20 µg/L. Lakes over 20 µg/L are classified as eutrophic and may exhibit persistent, nuisance algal blooms. Recently, climate change and lake warming has changed the lake response to phosphorus, with even low TP concentration lake experiencing blue green algal blooms.

Since 2002, all four stations have reported TP concentrations between 5 and 10 µg/L, classifying the lake as oligotrophic. With one exceptional year. In 2008, higher TP concentrations were associated with a sewage pipe leak in the spring. Since 2015, TP concentrations have been slightly lower than previously, with concentrations at all four stations at around 5 µg/L.



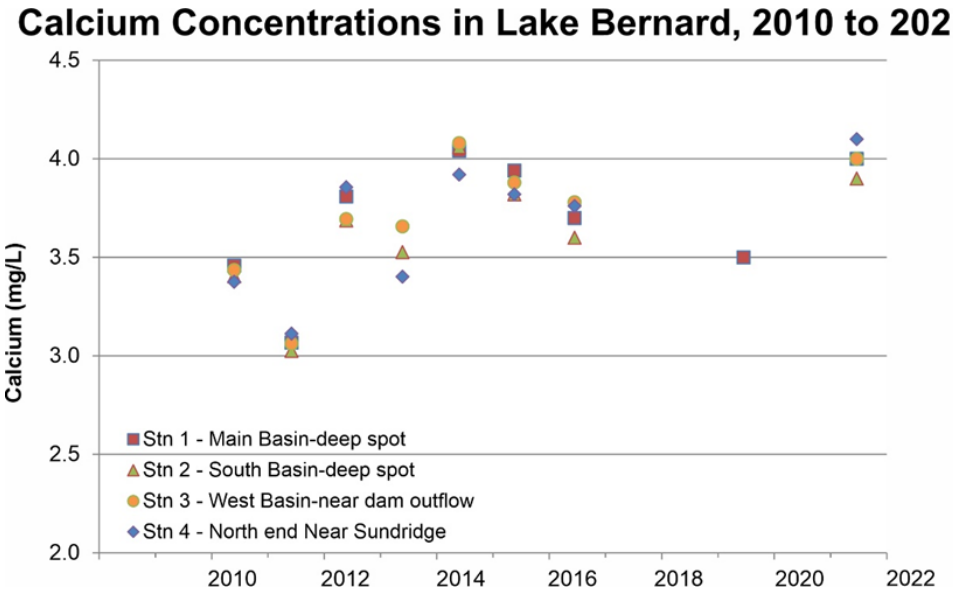
Calcium Results

Current Situation

Calcium is an important component in Ontario waters as low concentrations impact the survival and reproduction numerous aquatic organisms including crustaceans, molluscs, insects and fish. Shield Lake calcium concentrations declined due to decades of acid rain and logging which depleted watershed stores of calcium.

Lakes have classified as: Not stressed - Ca >2.0 mg Ca/L
Vulnerable - Ca 1.5 to 2.0 mg Ca/L
Stressed - Ca <1.5 mg Ca/L

Existing calcium concentrations in Lake Bernard (4 mg Ca/L) classify the lake as not stressed.



However, these concentrations are low enough that they may render the zooplankton community more susceptible to the impacts of chloride. Calcium concentrations in Muskoka lakes are only slightly lower on average at 2.5 mg/L, which has made them more

prone to impacts on zooplankton. In order to address this, Muskoka has introduced a program whereby flyash from fireplaces, which is rich in calcium) may be put into the watershed and subsequently washed into the lake. Publications (fotmw.org)

Dissolved Oxygen and Temperature Results

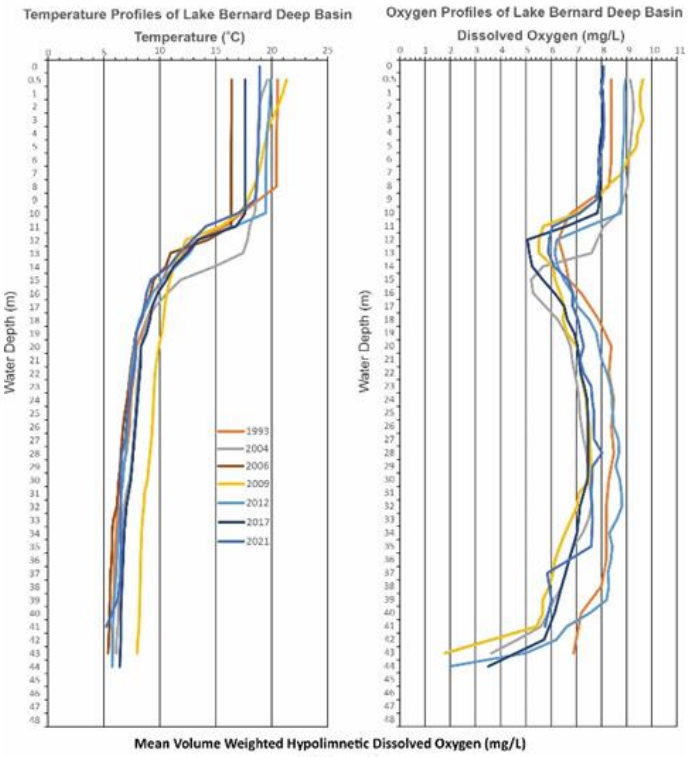
Current Situation

According to the presentation - *Lake Trout and Shoreline Development on Bernard Lake* (MNR, 2011), Lake Bernard is at its development capacity. This is based on the Mean Volume Weighted Hypolimnetic Dissolved Oxygen (MVWHDO) levels which decreased below the juvenile lake trout threshold of 7 mg/L after 1989 (1990, 2000, 2004, 2005, 2009, and 2017) based on MNR records (Steve Scholten, 2021 and MNR, 2011) and LBPOA sampling in 2021. Due to the unavailability of a suitable DO meter and cable, a profile was not collected in 2022.
Annual differences in MVWHDO may be a function of multiple drivers including changes in primary production, lakewater transparency and regional climatic factors (Nelligan *et al.*, 2019)*.
*(Long-term trends in hypolimnetic volumes and dissolved oxygen concentrations in boreal forests of south-central Ontario, Canada. CJFAS, 76(12): 2315-2325)

Lake trout were selected as they are an important species in Ontario due their position as a top predator and their Economic/social value (fishing). Lake trout have specific habitat requirements including cold water and high oxygen. It is the only major species that requires a well-oxygenated hypolimnion to support a healthy population. Consequently, they are vulnerable to changes in water quality. Climate change has resulted in slow warming of Lake Bernard waters although there is no clear trend. Warmer shallow waters during periods of calm, hot weather can cause local depletion of oxygen in bottom waters.

Lake Bernard
Property Owners' Association

Lake Bernard Temperature and Dissolved Oxygen Profiles, 1993 to 2021 in September



Mean Volume Weighted Hypolimnetic Dissolved Oxygen (mg/L)

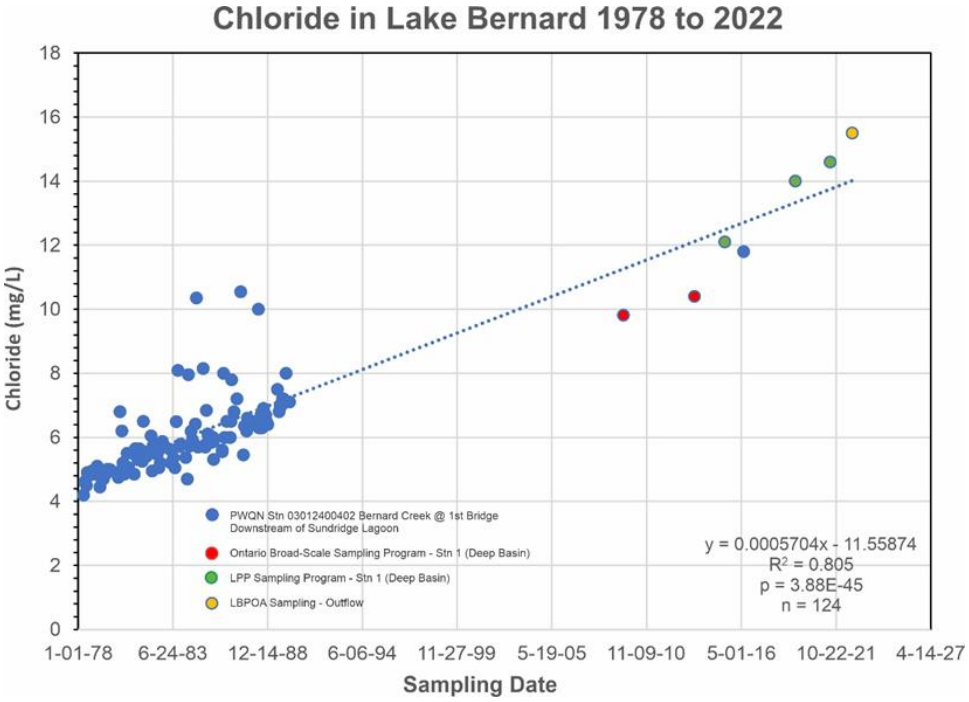
1993	**8**
2004	**6.6**
2006	**6.3**
2009	**6.6**
2012	**8**
2017	**6.9**
2021	**7.1**

Salinization and Road Salt

Current Situation

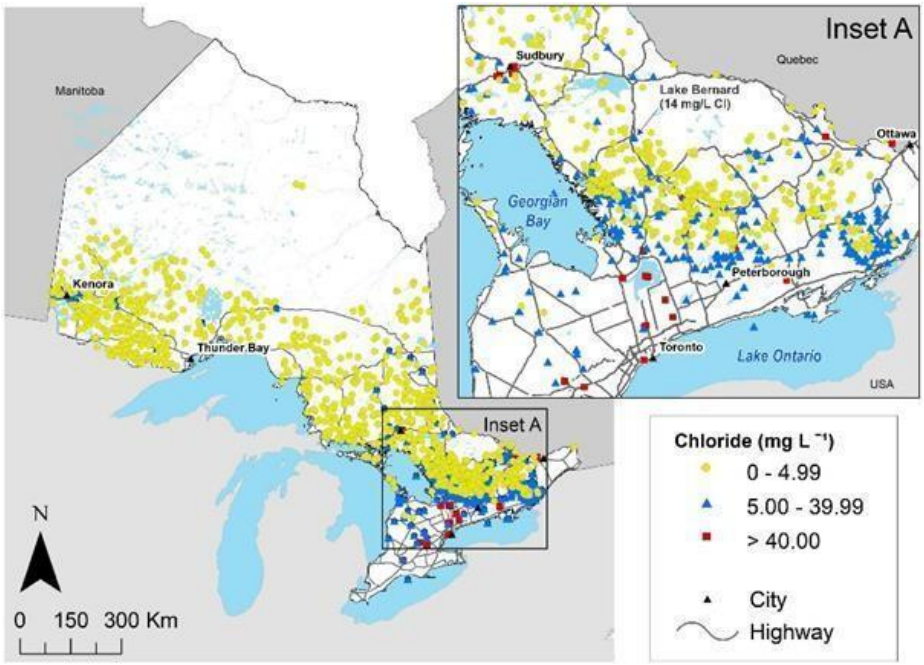
The release of the most recent LBPOA sampling, and LPP chloride (Cl) data to the FOCA website, combined with the 2009 and 2013 water chemistry data associated with the Broad-Scale Monitoring Program, has disclosed a potentially disturbing situation in Lake Bernard.

Cl concentrations in Lake Bernard have reached **15.5 mg/L** at the dam outflow as of September 2022.



Cl has increased from 9 mg/L in 2009 to 15.5 mg/L in 2022. This represents a 6.5 mg/L increase over 13 years, or **0.5 mg/L** per year. Results from the 2022 LPP water sampling are not as yet available.

To put it into some context, here is Lake Bernard in relation to surrounding lakes where Cl concentrations have been recently measured. We represent a lone blue triangle amongst yellow (the lower category).



So what does this mean? How does this concentration of Cl relate to background? (concentration before road salting started).

There is currently no data available for Lake Bernard or surrounding lakes to provide that directly.

Threats

A recent study completed for the Muskoka area lakes has shed some light on the potential impacts from increased Cl concentrations in lakes.

Friends of the Muskoka Watershed completed a recent study – The Road Salt Threat to Muskoka Lakes: Answering 10 Key Environmental Questions (Dr. Norman D. Yan, 2020; Retired Senior Scientist with MOECP and York Univ Prof).).

In this study, Cl concentrations in lakes with no winter-maintenance roads in their catchments averaged about 0.5 mg/L four decades ago and have subsequently decreased to about 0.25 mg/L. This is now regarded as the background concentration for Muskoka lakes.

In the absence of other data, and no readily available data to prove otherwise, we may accept this concentration (0.25 mg/L) as applicable to Lake Bernard until data to the contrary is made available.

How do we know that road salt is responsible for the elevated Cl levels?

The almost perfect 1:1 correspondence of Cl with sodium (Na) concentrations across the 700-fold range in Cl in Muskoka lakes establishes that the Cl salt source is NaCl. As there are no natural local marine salt deposits in Muskoka, and the lakes with elevated Cl levels all have major winter-maintained highways in their immediate catchments, road salt is the

only logical salt source. There is no reason to expect that the situation in Lake Bernard is any different.

What Cl levels are safe for aquatic biota in Muskoka?

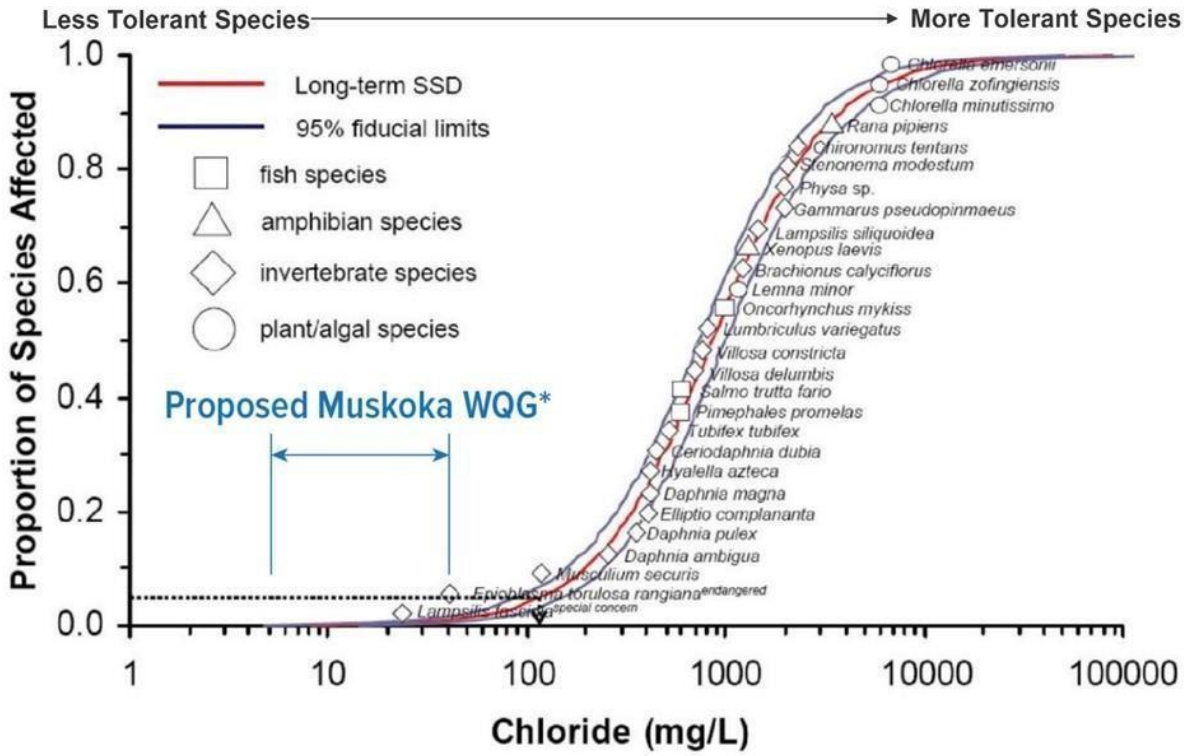
A Muskoka-specific Water Quality Guideline (WQG) for Cl should be well below the **Canadian WQG of 120 mg/L** (CCME, 2011), but choosing a specific protective threshold is difficult, both because the modifying effects of water hardness and food levels have been assessed only for 6 water flea species, and because the choice involves a value judgment. How protective do we wish to be? A Muskoka-specific protective guideline should likely fall between **5 and 40 mg of Cl/L, i.e. between 20 and 160 times, respectively, the current Muskoka background level of 0.25 mg/L.**

The current **Canadian WQG of 120 mg of Cl/**L was set to protect 95% of aquatic species from long-term Cl exposure, without consideration of site-specific modifiers of toxicity. Brown and Yan (2018) proved that lake nutrient status is a key modifier, because in Muskoka's typically low-nutrient waters, algal food densities are low enough that 50% of their test daphniids died in lab experiments at 40 mg of Cl/L, 3 times below the Canadian WQG. Food stress increased Cl sensitivity. Arnott et al (2020) proved that water hardness also modifies Cl toxicity. When reared and tested in waters with Ca levels typical of Muskoka lakes (2.5 mg/L Ca), their 6 native *Daphnia* species all suffered reproductive impairment at 40 mg of Cl/L, while some of the species, such as the ubiquitous *Daphnia mendotae*, suffered at levels as low as 5 mg of Cl/L (Figure 5).
We don't yet know if a combination of low food and low Ca would further amplify Cl sensitivity, although this is certainly possible, and Ca and nutrient levels are typically both low in Muskoka lakes.

Would a Muskoka-specific WQG set using daphniid data protect the majority of aquatic life in Muskoka lakes? We don't currently know, because the research that Elphick et al. (2011) and Arnott et al. (2020) have done to prove water hardness alters Cl toxicity for daphniids has not been repeated for other plant and animal taxa. What we do know is that daphniids are quite sensitive to Cl, more sensitive than all the aquatic plants and animals examined by the CCME with the exception of a few mollusc species. The three species of *Daphnia* they included all fell low on the Cl species sensitivity curve (Figure 6). Hence, setting a Muskoka specific WQG based on the sensitivity of 6 native daphniids to Cl would likely go a long way to protecting the majority of aquatic species.

Setting a target range of 5 to 40 mg/L of Cl (see Figure 6) reflects a range over which damage to aquatic biota in Muskoka may be anticipated and dropping the guideline from 120 to between 5 and 40 mg/L would also likely protect the majority of mollusc species which appear to be even more sensitive to Cl than daphniids.

We do not believe it is defensible to choose a single number for a Muskoka WQG for Cl within the 5 to 40 mg/L range without more research on Cl toxicity to plant and other animal species at the low food and hardness values that are typical of Muskoka lakes. However, setting a guideline even at 40 mg of Cl would be an improvement over using the current Canadian WQG, even though damage to Muskoka animal plankton communities should be anticipated at 40 mg Cl /L, given Arnott's lab and Valleau's field observations.
Figure 6 (from CCME, 2011)



Based on a sample of over 800 Ontario lakes, Arnott *et al*. (2020) estimated that 23% of Ontario's recreational lakes currently have Cl levels between 5 and 40 mg/L, levels that she and her colleagues considered problematic for animal plankton assemblages. In the District's latest complete sampling cycle of 191 lakes and lake-sites, 56% of lakes had <5 mg/L of Cl, leaving 44% with more than 5 mg/L of Cl. Only 2% of lakes had more than 40 mg/L of Cl, so the choice of a safe Cl level for Muskoka produces a large range in the estimated number of sites threatened by Cl toxicity.

Rather than using the lab-based toxicity data of Arnott and colleagues, an alternative approach is to use the field-based evidence from Valleau and colleagues (2020), i.e. the Cl level at which animal plankton communities in nature have actually been altered by road salt. That threshold would be **30 mg/L of Cl** at the moment and would suggest 6% of Muskoka's monitored lakes have problematic Cl concentrations. However there has not been an attempt to document Cl toxicity in the field beyond the 5 lakes that Valleau and colleagues studied, and all of her study lakes were impacted. Hence, her **30 mg/L** should be considered a conservative impact threshold.

This is early days in our understanding of the extent to which Cl toxicity is affecting Muskoka Lakes. If we wish to be very protective and choose 5 mg/L, this would suggest 44% of the District's monitored lakes are impacted. If that seems alarmist, recall that the current natural background in Muskoka is 0.25 mg/L, so 5 mg/L represents a 20-fold (2000%) level of salt contamination compared to the current natural baseline. If we wished to be conservative and choose 30 mg/L, then 6% of the District's monitored lakes would be considered damaged. What we cannot recommend is using the Canadian WQG of 120 mg/L, because it will not protect typical Muskoka lakes given that we now have clear evidence of Muskoka-specific modification of Cl toxicity by low food and Ca levels, just the

sort of site-specific toxicity modifier the CCME (1999) warned should be considered. It is important to remember that the District samples just over 10% of the lakes in the Muskoka watershed, so the true number of lakes damaged by road salt is not currently known.

So what does this mean for Lake Bernard?

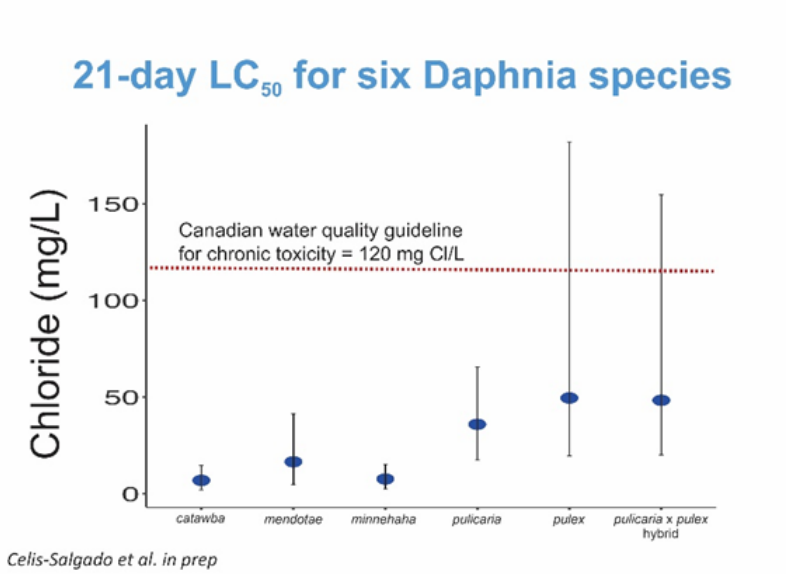
Two things are different for Lake Bernard compared to the lakes in the Muskoka watershed. For one, the lake is not as nutrient-poor as has been described for the Muskoka lakes. The water quality study completed by OWRC (1969) indicated that the lake was oligotrophic-mesotrophic based on the phytoplankton assemblage. Second, the Ca concentration is slightly higher at 3.5 mg/L (as of June 2020). Both of these factors may lessen the potential toxicity of Cl to the flora and fauna in Lake Bernard.

Recommended Actions

It may be useful to attempt to recreate the species sensitivity distribution shown opposite for Lake Bernard. This would require a more complete and recent listing of the phytoplankton, zooplankton, benthos, macrophytes, amphibians, and fish currently in the lake. This would be followed by a literature search to collect as much Cl toxicity data associated with these species to recreate the species sensitivity distribution and create a site-specific Water Quality Guideline (WSG).

A recent study (Hintz et al. (2022) found that lake food webs were not protected by current Cl thresholds. The results were consistent with those of Arnott et al. (2020) who showed that cladocerans can experience negative effects at concentrations of **5 to 40 mg Cl/L**. These are well below the current CCME guideline of **120 mg/L**. Consequently, current guidelines cannot be expected to protect aquatic life from the impacts of Cl inputs.

Celis-Salgado *et al.* (in prep) identified the 21-day LC50 (mortality) at **10 mg Cl/L** for two of the most common *Daphnia* spp (*D. Catawba and D. mendotae*) in the Muskoka region. That is below the **15.5 mg Cl/L** currently measured in Lake Bernard and suggests that the zooplankton community in the lake may already be under stress. In addition, they also found reductions in reproductive success occur at lower concentrations.



Celis-Salgado et al. in prep

That would suggest that it is time to seriously consider ways to mitigate the impact of Cl on Lake Bernard. The first step should be the collection of water quality samples from inflows, including groundwater, from around the lake, to assess the current loadings of Cl into Lake

Bernard. In addition, some municipalities, including Barrie (Anon, 2016) and the Lake Simcoe Conservation Authority (LSRC, 2017) have completed Salt Optimization Strategies. In addition, a water sample from the deep basin for particulate carbon would be useful to establish the food levels and potential mitigative effects on Chloride toxicity. Any historical water quality data including Cl would also be useful in establishing a more site-specific background concentration.

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Hintz, William D., a,b,1,2 , Shelley E. Arnottc,1 , Celia C. Symonsd , Danielle A. Grecoc , Alexandra McClymontc , Jennifer A. Brentrupe , Miguel Canedo-Arg ~ uelles € f , Alison M. Derryg , Amy L. Downingh , Derek K. Grayi , Stephanie J. Mellesj , Rick A. Relyeak , James A. Rusakc,l , Catherine L. Searlem, Louis Astorgg , Henry K. Bakern , Beatrix E. Beisnerg , Kathryn L. Cottinghame , Zeynep Ersoyo , Carmen Espinosap , Jaclyn Franceschinii , Angelina T. Giorgiok , Norman Gobeler € q , Emily Hassalr , Marie-Pier Hebert g,s , Mercedes Huynhi , Samuel Hylandert , Kacie L. Jonasenm , Andrea E. Kirkwoodr , Silke Langenhederu , Ola Langvallv , Hjalmar Laudonw, Lovisa Lindx , Maria Lundgreny , Lorenzo Proiaz , Matthew S. Schuleraa, Jonathan B. Shurinn , Christopher F. Steinerbb , Maren Striebelcc , Simon Thibodeaug , Pablo Urrutia- Corderou,dd, Lidia Vendrell-Puigmitjaz , and Gesa A. Weyhenmeyeru. 2022. Current water quality guidelines across North America and Europe do not protect lakes from salinization. Proc Natl Acad Sci USA 119(9):1-10.

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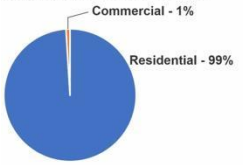
Lake Bernard
Property Owners' Association

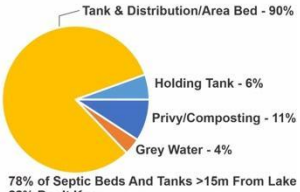
2021 Septic System Survey Results

2021 Lake Bernard Septic Survey Results
Number of Survey Responses - 103

1. Type of Residence on Lake

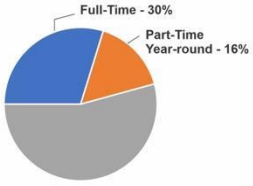


3. Sewage Disposal Type

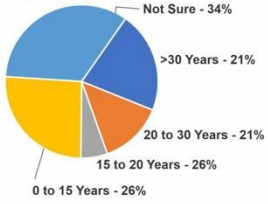


78% of Septic Beds And Tanks >15m From Lake
22% Don't Know

2. Full- or Part-Time Residence

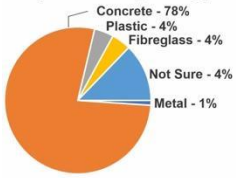


3b. Age of Septic System

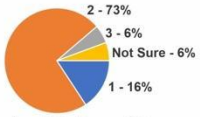


2021 Lake Bernard Septic Survey Results
Number of Survey Responses - 103

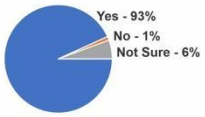
4. Septic or Holding Tank Type



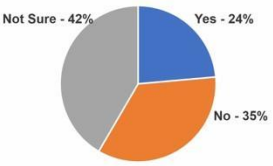
6a. How Many Lids



6b. Are Lids Accessible

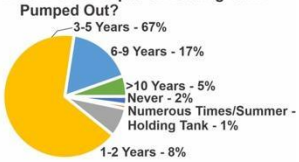


5. Presence of Effluent Filter



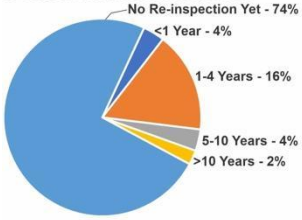
90% know it needs to be checked annually

7. How Often Septic or Holding Tank Pumped Out?

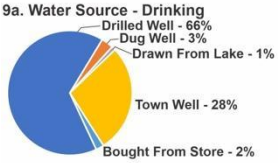


2021 Lake Bernard Septic Survey Results
Number of Survey Responses - 103

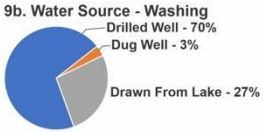
8. Date of Most Recent Inspection



9a. Water Source - Drinking



9b. Water Source - Washing



10. Practices Followed at Residence

Inspect septic tank regularly – check for leaks & smells; rinse effluent filter	82%
Not putting harsh chemicals or antibacterial products in the septic tank	94%
Putting only biodegradable items down the drain (no diaper wipes, etc)	96%
Having the septic tank pumped out on a regular basis	89%
Conserving water use (use full dishwasher and laundry loads)	88%
Keep detailed records of septic system's location, care and maintenance	68%

11. Family & Visitors Aware Septics Need Special Care?

Yes - 95%

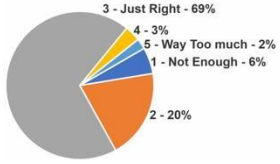
12. If Rent, Are Tenants Aware Septics Need Special Care?

Yes - 12%
No - 2%
Not Rented - 86%

13. Preference for Source of Septic Information

2021 Lake Bernard Septic Survey Results
Number of Survey Responses - 103

14. Does LBPOA Give Sufficent Information? (Scale of 1 to 5)



E. Lake Bernard Dam Operation

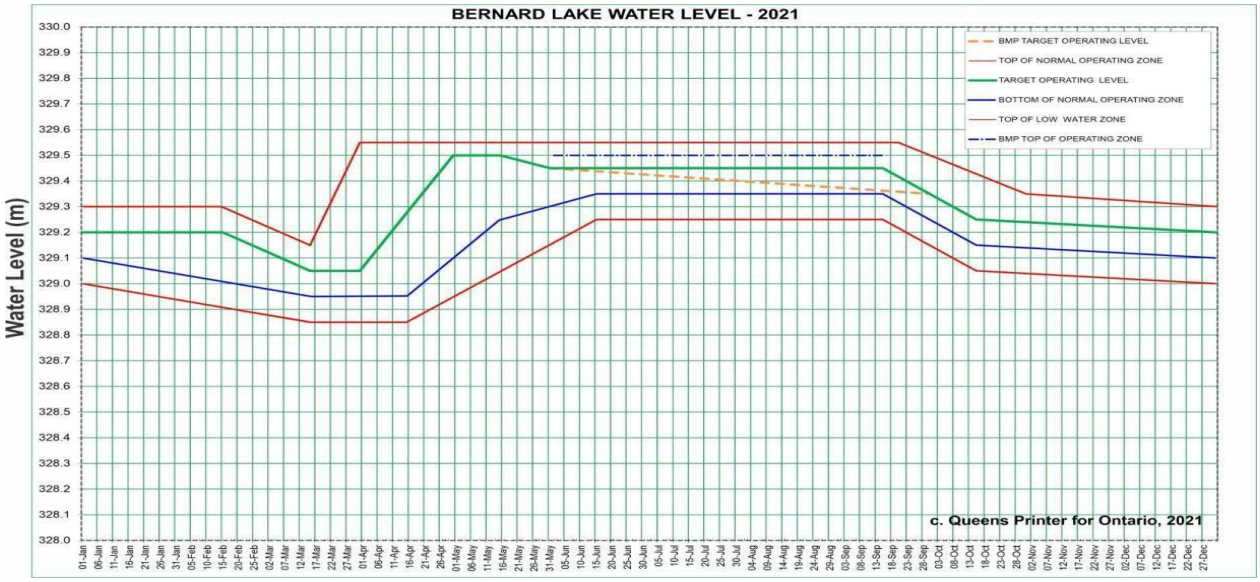
Water Levels on Lake Bernard

The water level on Lake Bernard is managed by an outlet dam located in the SW corner of the lake. This 4 sluice dam, installed in 1959, was designed to manage the flow of water primarily to ensure that the water level was maintained at a constant level over the summer months. The water fluctuation on the lake is maintained within a range of 60cm (2 feet). This is a fairly narrow range for such a large body of water with 23.0 km of shoreline, without an island. The release of water through the dam has an impact on the rest of our watershed, a factor that must be considered in MNR decisions. Water level maintenance is governed by the Magnetawan River Water Management Plan (MNR, 2006; draft) and is solely the purview of the MNR. It should be noted that precipitation can be highly variable as demonstrated by the heavy rains in 2021. and is intermittently delivered by someone up above us. Due to the design of the dam, water level control with a fairly quick response time is not possible. Remote monitoring, via satellite, of the water level at the dam was installed by MNR / EC (Environment Canada) in 2006 and is available over the internet.

Water Level and Flow - Environment Canada (ec.gc.ca)
https://wateroffice.ec.gc.ca/report/real_time_e.html?stn=02EA020

At the dam, you can view the water levels on measuring rods on both the upstream and downstream sides. The correlation with the rule curve is exact, with the summer water level plan to maintain at 329.45 (metres above sea level – or Canadian Geodetic Datum).

MNR has issued and utilizes a standardized curve to manage the water level:



Bernard Creek Clearing

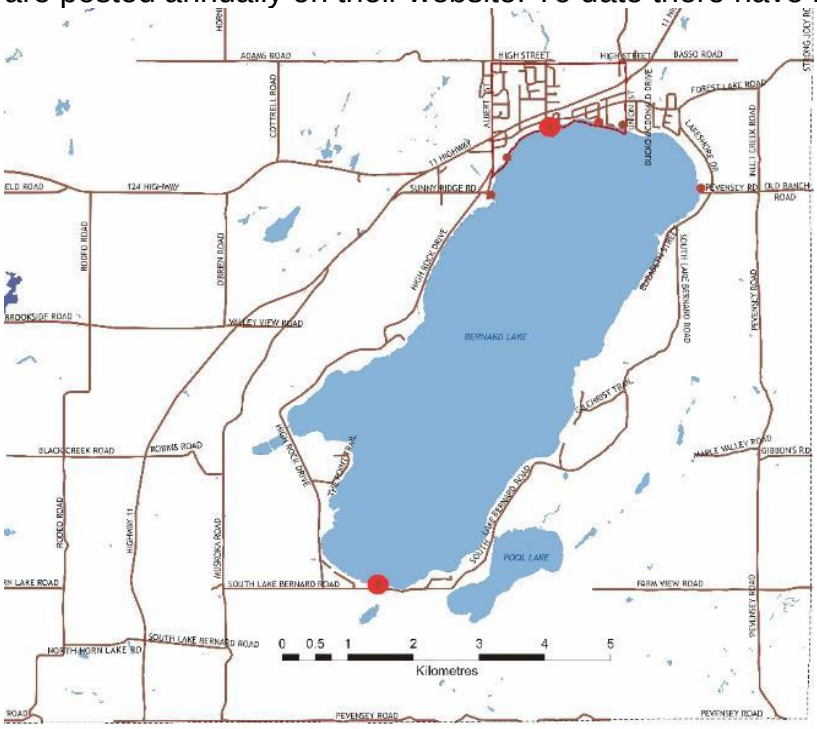
To manage lake levels to that prescribed by the MNR rule curve, Bernard Creek needs to be able to flow without serious obstructions. Beaver dams and debris slow the flow. Many of the dams are created on private land which means the municipality cannot trespass without the landowner's approval to remove the obstruction. Removing these obstructions in the late fall should help somewhat as it is difficult and dangerous to remove these obstructions during high water in spring. Hiring someone to do this may be a liability. The same liability would not exist if community members took it upon themselves to do this voluntarily as has been the recent practice of the LBPOA.

F. Safety

Safety

Safety on the lake is a concern to many people who use it. The LBPOA along with the Township of Strong have been ensuring that bright orange markers or buoys properly mark shoals and deadheads under the water since 2005. Swimming safety is up to the discretion of individuals using the lake.

Public swimming areas are tested monthly for *E. coli* during the summer months by the Ministry of Health office in North Bay. Testing is conducted at two sites - Lions Park Beach at the north end and South Bernard Lake Beach at the south end of the lake. The results are posted annually on their website. To date there have no exceedances at either site.



Township Of Strong

Beaches Sampled by The Ontario Ministry of Health - North Bay

1. Barrie Street Beach
2. Lions Park Beach
3. South Bernard Lake Beach
4. Sunny Ridge Beach
5. Sundridge Victoria Beach
6 Union Street Beach
7 Checkerboard Beach